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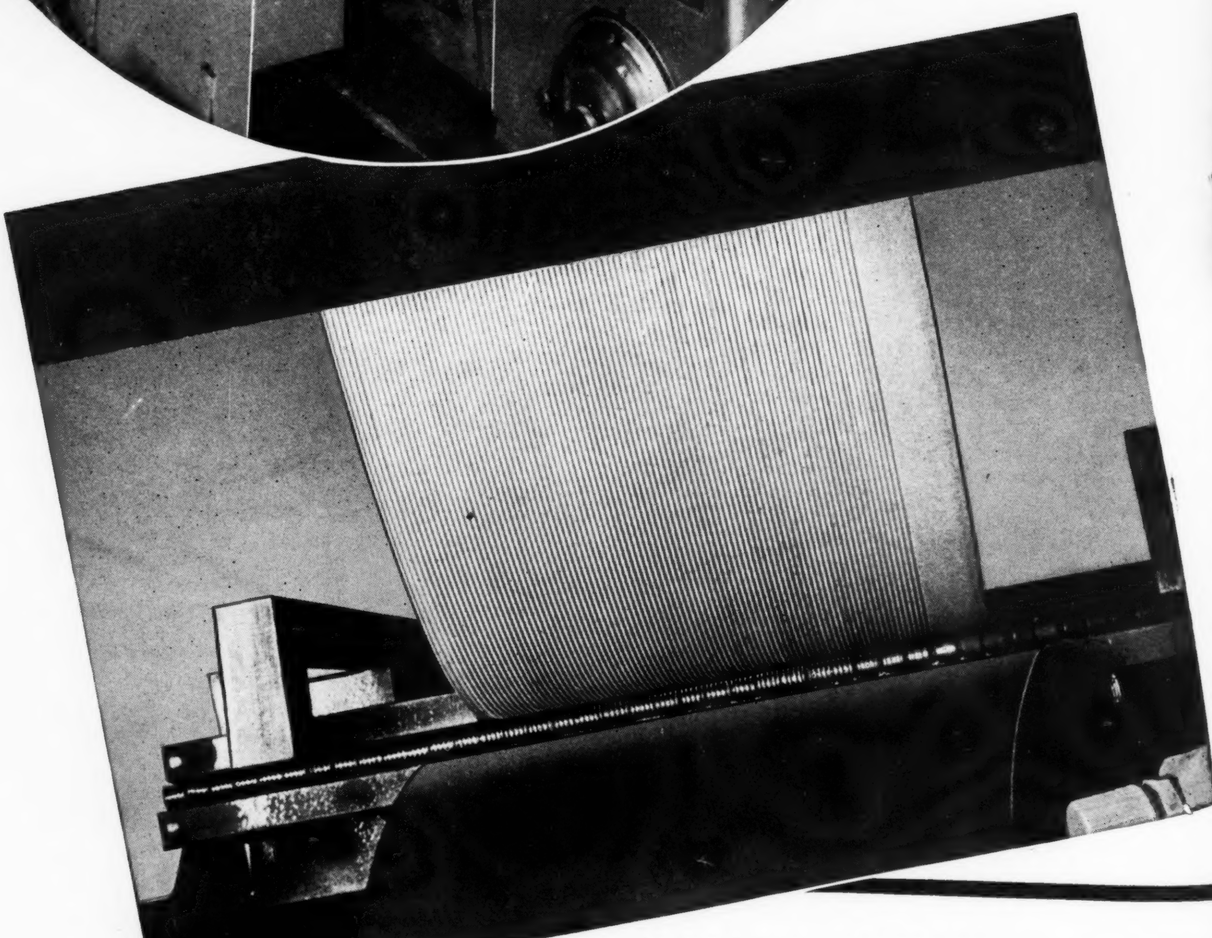


WORLD'S LARGEST EXCLUSIVE

MACHINERY

Vol. 55 APRIL, 1949 No. 8

Dynamic Balancing of Assembled Automobile Engines

Automotive Engine Assemblies are Dynamically Balanced within 0.5 Ounce-Inch by the Hudson Motor Car Co. on a Machine Designed and Built by the Gisholt Machine Co.

By CHARLES H. WICK

A FUNDAMENTAL requirement for improving the performance of automotive engines is the minimizing of unbalance in rotating and reciprocating parts. Accurate balancing of these parts reduces vibration and provides smoother, quieter operation, longer bearing and engine life, and greater efficiency.

It was usual in the pioneer automotive days merely to balance the engine crankshaft statically. As early as 1915, however, the Hudson Motor Car Co. began balancing crankshafts both statically and dynamically. The reduction in vibration resulting from this practice permitted increasing the speed so that the output of the

engine was raised from 48 to 76 H.P. without changing the cylinder bore or piston stroke.

Many improvements have been made in balancing equipment and methods since that time. However, unbalance—with its consequent vibration—is still a problem in the manufacture of internal combustion engines. The major contributing factor to this problem is the accumulation of unbalance when rotating and reciprocating members are assembled together. Despite the accuracy with which the individual components are balanced separately, unbalance is usually evident in the assembled engine.

Recently, the Hudson Motor Car Co. conceived the idea of dynamically balancing the rotating and reciprocating parts of the engine as a unit after assembly in the cylinder block. The special Dynetric balancing machine seen in the heading illustration was designed by the Gisholt Machine Co., Madison, Wis., for this purpose.

With this machine, dynamic unbalance of the engine assembly is quickly and accurately measured and located angularly. Automatically controlled drilling units, seen at the right in Fig. 1, are provided on the machine, and the depths required to be drilled for correcting unbalance are automatically set during the balancing. Thus errors in converting unbalance indications into depth of correction drilling are eliminated.

Prior to assembly in the engine, all rotating members of the engine are balanced individually, and the reciprocating parts are weighed and matched into sets. The clutch pressure plate, clutch assembly, flywheel, and vibration damper are statically balanced separately, while the crankshaft is both statically and dynamically balanced to within 0.3 ounce-inch. Connecting-rods and pistons are weighed, inspected to determine their center of gravity, and matched into sets for each engine.

The assembled engine, without the oil-pan, cylinder head, and accessories, is removed from

Fig. 1. All rotating and reciprocating parts of an automotive engine are balanced as a unit on this dynamic balancing machine

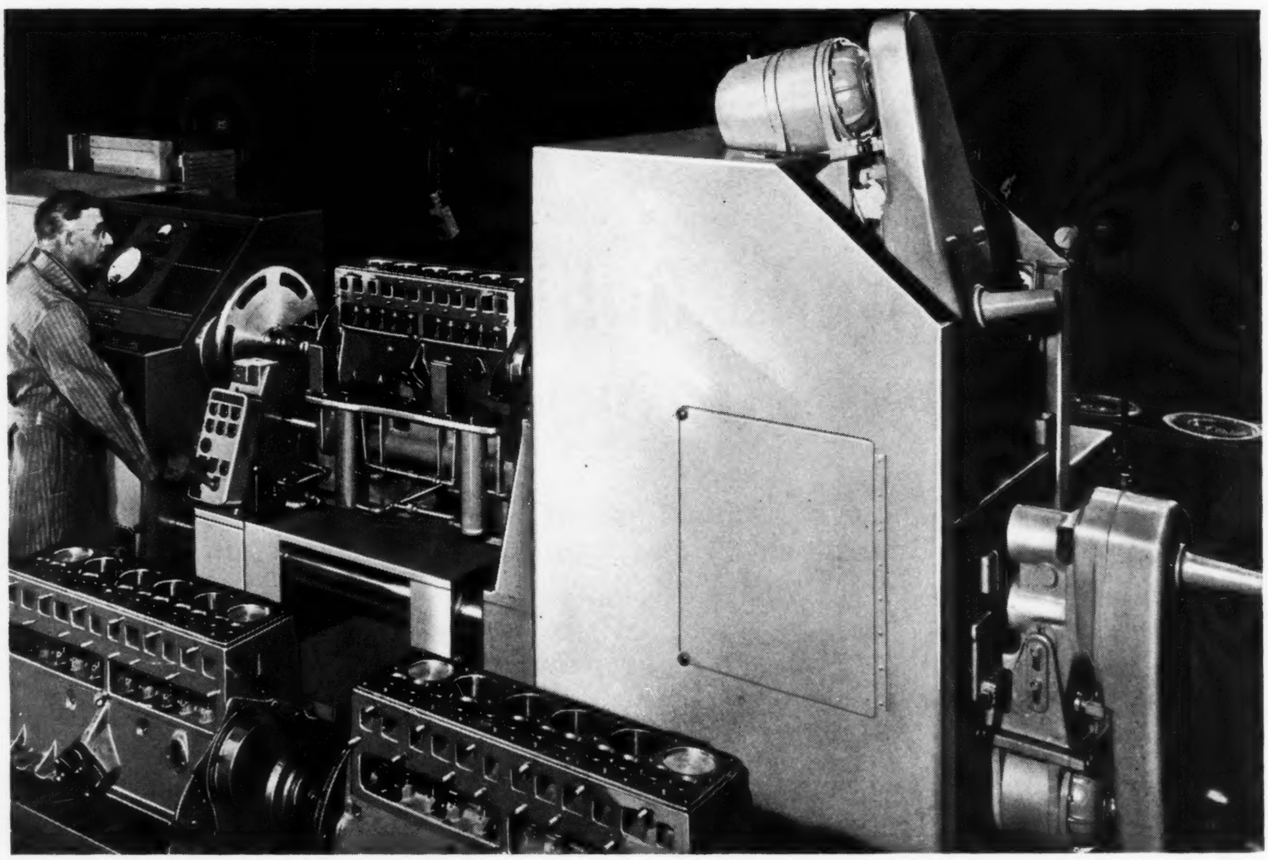


Fig. 2. A light-weight flexible cradle supports the engine during balancing, hydraulic clamps being provided to secure the engine to the cradle

a roller conveyor by means of an overhead hoist and lowered into a flexible cradle, Fig. 2, on the balancing machine. Four hydraulically actuated clamps secure the engine to the cradle. The cradle is suspended by steel wires, approximately 3/16 inch in diameter, so that if the rotating elements are not in balance, the cradle is free to vibrate in a horizontal plane. The light-weight cradle has a minimum effect in reducing the motion of the engine due to the forces of unbalance.

During balancing, the engine is driven at a constant speed of 475 R.P.M. by a 7 1/2-H.P. direct-current electric motor. Driving torque is transmitted from the electric motor to the crankshaft of the engine through flexible couplings, as shown in Fig. 3. Floor vibrations do not affect the unbalance measurements because the natural vibration frequency of the flexible cradle is very low relative to the rotational speed during balancing.

When the engine is rotating, the unbalance will cause vibration of the cradle. The resulting displacement is "picked up" at two points, one at each end of the cradle. At each point, the displacement is transmitted by means of a rod to a wire-wound coil that moves within the field of a permanent magnet. This motion of the coils in the magnetic fields generates alternating currents in the coils, the voltages of which are directly proportional to the amplitude of vibration.

The generated voltages are transmitted to an amplifying unit which multiplies them many thousands of times. The amplified voltages, in turn, are transmitted to a wattmeter, which serves as an indicator to show the amount of unbalance. Unbalance so small as to cause a movement of less than 0.000025 inch at the "pick up" points of the cradle supporting the engine is detected.

The planes selected for correcting the unbalance in the Hudson engine are the inside face of the flywheel and the outer face of the damper pulley. Separation of unbalance effects in each of the two selected correction planes is accomplished by electrical networks. Either correction plane can be selected by means of a "left-right" switch, the switch being moved to the left for the flywheel plane, and to the right for the damper pulley plane. Indications of unbalance are given directly for either plane, and each indication is unaffected by unbalance in the other plane.

In addition to showing the amount of correction required in each of the selected planes, the balancing machine indicates the angular locations for such corrections. The wattmeter measures the average power, which is the product of

an instantaneous voltage and an instantaneous reference current. The instantaneous voltage employed is the amplified output of the previously described electrical network, while the instantaneous reference current is supplied by a sine-wave generator coupled to the engine being balanced.

With the "angle-amount" switch moved to "angle" and the "left-right" switch to the position required for the plane to be measured, a generator handwheel is rotated until the wattmeter reads zero. This shifts the phase location of the reference current until it is 90 degrees out of phase with the network voltage. A graduated protractor connected to the generator will then show the angular location at which correction should be applied to balance the engine in this particular plane. After noting this reading, the operator repeats the process to find the angular location in the other plane.

To complete the static and dynamic balancing of the rotating engine, it is now necessary to determine the amount of correction that must be made at the known angular position in each of the two correction planes. This is accomplished by moving the "angle-amount" switch to "amount." Then with the "left-right" switch in the correct position for the plane to be measured, the weighing dial for that plane is rotated until the wattmeter registers zero. This dial records the amount of unbalance in that plane, and a similar dial records the unbalance in the other plane.

Attached to each weighing dial is a self-synchronous transmitter which is rotated exactly the same amount as the dial. Each self-synchronous transmitter is electrically connected to a self-synchronous receiver in the corresponding drill head. The receiver duplicates exactly the angular setting of the transmitter. A cam on each receiver provides a means by which the recorded reading of the weighing dial is converted into depth of hole to be drilled.

The amount of correction required for unbalance in the flywheel is shown by the position of the left-hand weighing dial, while the amount necessary for the damper pulley is indicated by the setting on the right. Twenty-two

Fig. 3. Torque from a constant-speed electric motor is transmitted to the engine crankshaft through the flexible couplings shown

units on the left-hand dial represent 1 ounce-inch of unbalance in the flywheel plane, while twenty-six units on the right-hand dial equal 1 ounce-inch of unbalance in the damper pulley plane.

The average unbalance encountered in either the flywheel or the vibration damper is forty-five units, representing about 2 ounce-inches. This is corrected by drilling so that each engine is balanced within 0.5 ounce-inch. Engines indicating more than 100 units of unbalance (about 4 ounce-inches) are returned for reworking.

To correct the indicated unbalance, rotation of the engine is halted by depressing a push-button. The engine is then rotated by means of a handwheel until the reading on a rotary protractor agrees with the angular unbalance reading obtained for this plane on the stationary protractor during balancing. Another push-button is then depressed to start the drilling cycle. This procedure is repeated to balance the engine in the other plane.

The correction drilling units are Leland-Gifford hydraulically fed drilling spindles. They are both mounted at the right-hand end of the machine. One of the units is mounted horizontally, its spindle and drill extending below the cradle, under the engine being balanced, as seen in Fig. 2, to drill the flywheel. The other unit is angularly mounted, as illustrated in Fig. 4, to drill perpendicular to the angular face of the damper pulley.

A 3/4-inch diameter drill, ground to a standard point and rotated at 410 R.P.M., is employed to make the correction in the cast-iron damper pulley. A 1-inch drill with a 160-degree point, rotating at 230 R.P.M., corrects the steel flywheel. Both these drills are made of high-speed steel and are fed at the rate of 0.013 inch per revolution.

After completing the drilling operations, the engine is again rotated to see that the unbalance is within the limits specified. The floor-to-floor time required for balancing each engine is less than three minutes. Balanced engines are ready for assembly in the automobiles after attaching the oil-pan, cylinder-head, and accessories.

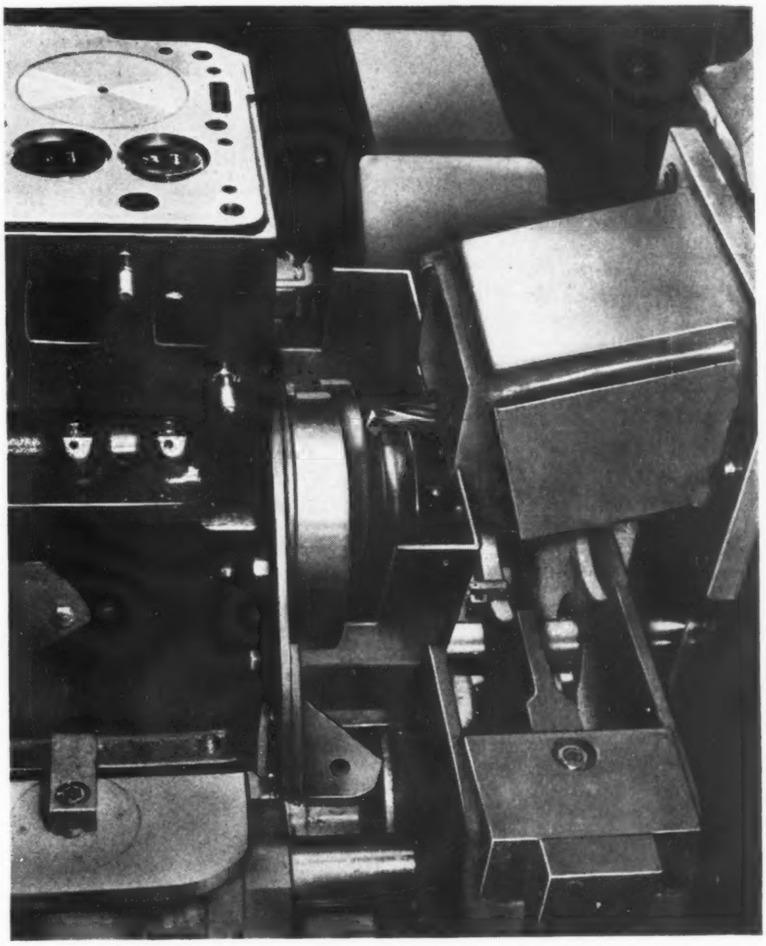


Fig. 4. An angularly mounted drill is used to remove metal from damper pulley in automotive engine assembly to correct unbalance

The Design of Surface Broaches

Effect of Such Factors as Type of Machine Used, Machining Operation, and Methods Employed in Making Broach on the Design of Surface Broaches
Second of Two Articles

By ARTUR SCHATZ
Consulting Engineer

AMONG the problems involved in designing surface broaches, the factors that cannot be calculated mathematically represent the most difficult to determine. In the first installment of this article, published in March MACHINERY, the effect of work factors, such as material, rigidity, shape, and condition of part prior to broaching, were considered. In the present installment, attention will be given to factors arising from the use of the broach, such as the nature of the machining operation, and type and capacity of the broaching machine. The effect on broach design of the methods used in making the broach will also be considered. Table 9 shows the relationship of these factors to each other and to the design of the broach.

Considerations involved in the machining operation include the length, width, and depth of cut, contour and location of cut, and tolerances and surface finish required. These factors influence the design of the broach in different ways, as illustrated in Fig. 6. The length and width of cut limit the number of teeth that can engage the work at any given instant without overloading the machine. This determines the allowable pitch, which must be equal to or larger than the minimum pitch calculated according to the required chip space.

In cases where the work part is narrow and long in the direction of the stroke and a sufficient shear angle can be used to push the chip spirally out of the chip space (Fig. 7), a pitch smaller than the minimum pitch can be employed. The cutting length of the broach can then be reduced to some extent. The cutting length of the broach is calculated not only on

Table 9. Basic Broach Elements Affected by Machining Operation, Construction of Machine, and Tools

Factors that Affect Broach Design	Type of Cutting Teeth	Cut per Tooth	Front Angle, Clearance Angle, Chip-Breaker Grooves	Shear Angle	Allowable Pitch	Chip Space, Min. Pitch	Length of Finishing Section	Cutting Length of Broach	Distribution of Metal Removal by: Strokes of Tool-Slide	Distribution of Metal Removal by: Cutting Insert	Tolerance of Cutting Edges	Broach Material
Machining Operation												
Length of Cut	..	..	..	X	X	X	..	X	X	..	..	..
Width of Cut	..	..	..	X	X	..	..	X	X	..	..	..
Depth of Cut	..	..	..	..	..	..	..	X	X	..	..	..
Form and Location of Cut	..	..	..	X	..	..	X	X	X	X	X	X
Work Requirements												
Tolerance	..	X	..	..	..	..	X	..	..	..	X	X
Surface Finish	X	X	X	X	..	..	X	X	X	X	..	..
Machine Construction												
Power	..	..	..	..	X	..	..	X	X	..	..	..
Stroke	..	..	..	..	..	..	..	..	X	..	..	..
Type of Machine	..	..	..	..	..	..	..	..	X	X	..	..
Broach Making Methods												
Machining	..	..	..	..	..	..	..	..	..	X	..	..
Heat-Treating	..	..	..	..	..	..	..	..	..	X	..	..

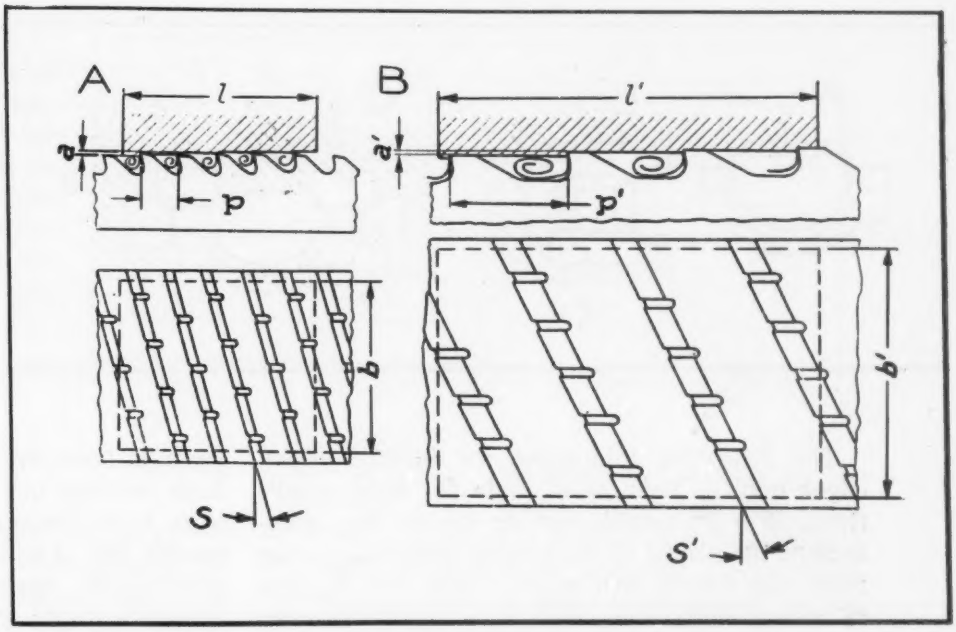


Fig. 6. Diagram comparing pitch and shear angle used when broaching work parts having short narrow layers of stock to be removed, as shown at "A," and long wide layers, as indicated at "B." The depth of cut per tooth in each case is shown at "a" and "a'," respectively, the width of cut at "b" and "b'" and the length of cut at "l" and "l'." The shear angle is indicated at "s" and "s'" and the pitch at "p" and "p'"

the basis of the pitch but also on the depth of stock to be removed; these two factors determine whether or not the broaching operation can be accomplished in one stroke.

The length and width of cut also determine the shear angle. A sufficiently large shear angle, as shown at *s* and *s'* in Fig. 6, equalizes the variations of the cutting force caused by teeth contacting and leaving the work, and thereby reduces vibration and improves surface finish. Shear angles can only be used where broaching is to be done on flat surfaces having at least one side open, or without a shoulder. The direction of the angle must be such that the chips are not forced against a shoulder by the side thrust. They are not suitable for the machining of slots and concave profiles. The contour and location of the cut determine the direction and size of the shear angle and the division of the cutting length of the broach into sections, as well as the location of these sections on the broach-holder (Fig. 8). The thrust developing from the shear angles of inserts should be balanced laterally and should force the work against the fixture.

The tolerance of the insert cutting edges depends on whether the dimensions of the work can be corrected by adjusting the inserts, as is usually possible when broaching flat surfaces (see view *A* in Fig. 9), or whether adjustment cannot be made, as, for example, in broaching a profile, because of the shape of the part or lack of space (see view *B* in Fig. 9).

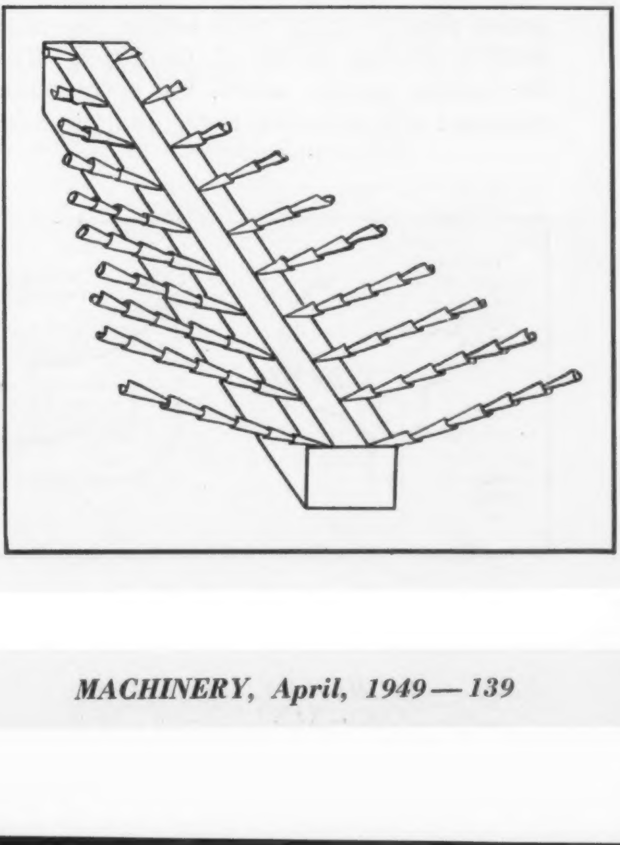


Fig. 7. Large shear angles on surface broaches remove chips from sides of chip spaces spirally

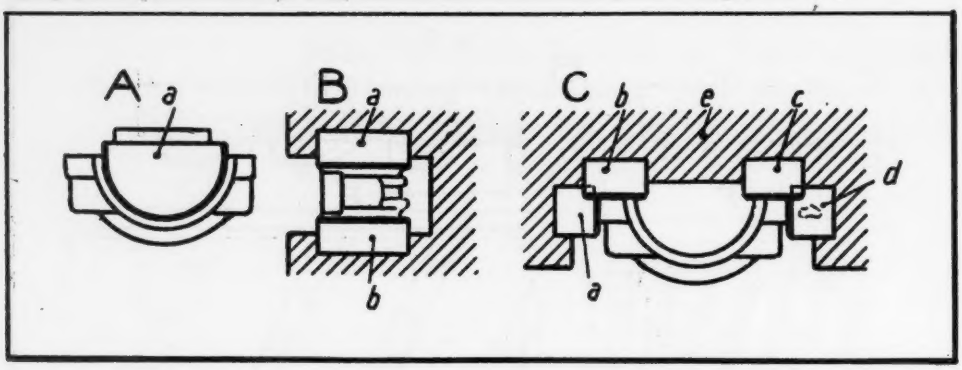


Fig. 8. The disposition of cutting inserts depends on location of surfaces to be broached. The inner surfaces of a half-round connecting-rod are being broached at "A," the end faces at "B," and the joint faces and sides at "C." Cutting inserts are shown at "a," "b," "c," and "d," and broach-holder at "e"

The following tolerances for insert cutting edges may be used as a guide for most conditions. For adjustable cutting inserts, the tolerance of the height of the cutting edge may range from plus 0.0008 inch minus 0.0004 inch to plus or minus 0.002 inch, with the same tolerances for all teeth in the cutting section. For non-adjustable cutting sections and profiled cutting edges, the tolerance may be from 0.00008 up to 0.00047 inch, according to the required tolerance and rigidity of the work part. This tolerance should be above the basic size, and final dimensions can be achieved by stoning after a trial broaching of some of the work parts.

Further maintenance of dimensional accuracy in broached parts is obtained by adjusting the inserts to compensate for wear, such adjustments being also possible with profiled inserts (Fig. 10). Cutting sections that cannot be adjusted require extra teeth behind the finishing teeth to prolong the life of the broach. Then as the cutting section wears, the extra teeth are reground into finishing teeth, and the finishing teeth, in turn, are reground into roughing teeth. Such sections are often made of a special steel with high resistance to wear to increase the service life. The length of the finishing sections of broaches, the number of teeth, and the increase in height of teeth for different conditions are given in Table 10.

The location of the stock to be removed by broaching may necessitate the machining of the work part by several strokes of the machine. This is true in the following cases:

1. Where the surfaces to be broached are so located that broaching by one stroke only would not permit rigid support of the work. (Such a condition is illustrated in Fig. 11.)
2. Where the work part is excessively bulky.
3. Where the broaching surface is extremely wide, as when broaching racks.
4. Where the tool for broaching in one stroke would be too complicated, heavy, or expensive, such as when broaching gears or the contours of disk-shaped parts. In cases of this kind, an indexing fixture can be used which brings the

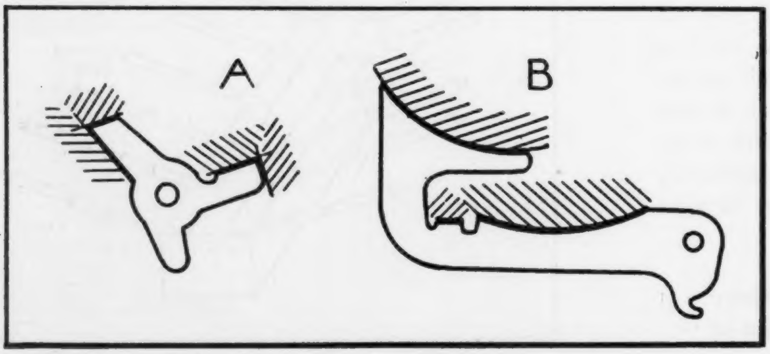


Fig. 9. A comparison of work parts to be broached, showing flat surfaces at "A," which permit adjustment of cutting inserts for dimensional corrections, and curved surfaces at "B," where dimensional corrections cannot be made by adjusting inserts

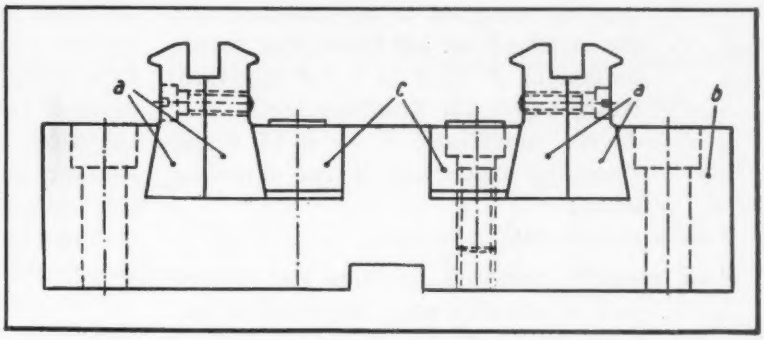


Fig. 10. Surface broaches with profiled cutting inserts which can be adjusted to compensate for wear by using shims. Height is adjusted by placing shims between inserts "a" and broach-holder "b;" width, by putting shims between the inserts. Clamping gibs are shown at "c"

individual parts of the work into the cutting position.

Limited tolerances on broached work require a small cut per tooth because of the yielding of the work part under the cutting forces. The finishing teeth can only remove very fine chips, and a sufficient number of sizing teeth with equal dimensions must be provided to permit the work to spring back. Sizing teeth must be made to close tolerances; and to maintain accuracy, they must be made of steel with high resistance to wear.

A small cut per tooth and a sufficient length of the finishing and sizing section of the broach also provide a high quality of surface finish. Larger front and clearance angles than usual also aid in producing good surface finishes, although the life of the broach is reduced thereby. The surface finish may further be improved by a suitable shear angle, the value of which depends upon the pitch.

The power of the machine, as well as the length and width of cut, determines how many teeth may be put into cutting engagement with the work at any given instant. Generally, a minimum of two or three teeth should be applied. Machine power directly affects the allowable pitch, and therefore indirectly affects the cutting length of the tool. If the power of the available machine is insufficient for the minimum pitch, which is calculated according to the required chip space, a larger pitch must be chosen in order not to overload the machine. In selecting this pitch, the gradual increase of the thrust caused by the dulling of the cutting edges must be taken into consideration.

In the pitch formulas which follow,

l = length of cut, in inches;

a = depth of cut, measured on one side of broach, or one-half difference in diameter of successive teeth in case of a round broach;

Table 10. Length of Finishing Section of Broaches for Various Conditions

	Type of Work			Machining Conditions				
	Rigid Work Parts	Flexible Work Parts		Close Tolerance		High Surface Finish		Curved Surfaces, Inserts Not Adjustable
Length of finishing section L	L	$2L$		$2L$		$2L$		$2L$ to $3L$
Number of teeth	4 to 5	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5	3 to 5	4 to 6 additional reserve teeth
Increase in height of teeth in finishing section, inch	0.0004	0.0004	No difference	0.0004	No difference	0.0004	No difference	No difference

F = a numerical factor depending upon the type of material to be broached and the depth of cut per tooth. For brittle materials, $F = 3$ or 4 for roughing teeth, and 6 for finishing teeth. For ductile materials, $F = 4$ to 7 for roughing teeth and 8 for finishing teeth;

b = width of cut, in inches;

P = pressure required, in tons per square inch of an area equal to depth of cut times width of cut, in inches (major cutting force);

T = usable capacity, in tons, of broaching machine = 70 per cent of maximum tonnage.

The minimum pitch given by Formula (1) in the following is based upon the required chip space. However, the minimum pitch should not be less than 0.2 inch unless a smaller pitch is required for exceptionally short cuts to provide at least two teeth in contact simultaneously with the part being broached. A reduction below 0.2 inch is seldom required in surface broaching, but it may be necessary in internal broaching.

$$\text{Minimum pitch} = 3\sqrt{l \times a \times F} \qquad (1)$$

Whether the minimum pitch may be used or not depends, as stated, upon the power of the available machine. The factor F in the formula provides for the increase in volume of the material as it is broached into chips. If a broach has adjustable inserts for the finishing teeth, the pitch of the finishing teeth may be smaller than the pitch of the roughing teeth because of the smaller depth of cut a. The higher value of F for finishing teeth prevents the pitch from becoming too small, so that the spirally curled chips will not be crowded into too small a space. The pitch of the roughing and finishing teeth should be equal for broaches without separate inserts (notwithstanding the different values of a and F) so that some of the finishing teeth may be ground into roughing teeth after wear makes this necessary.

The following formula gives the allowable pitch:

$$\text{Allowable pitch} = \frac{a \times l \times b \times P}{T} \qquad (2)$$

If the pitch obtained by Formula (2) is larger than the minimum obtained by Formula (1), this larger value should be used because it is based upon the usable power of the machine. As the notation indicates, 70 per cent of the maximum tonnage T is taken as the usable capacity. The 30 per cent reduction is to provide a margin for the increase in broaching load re-

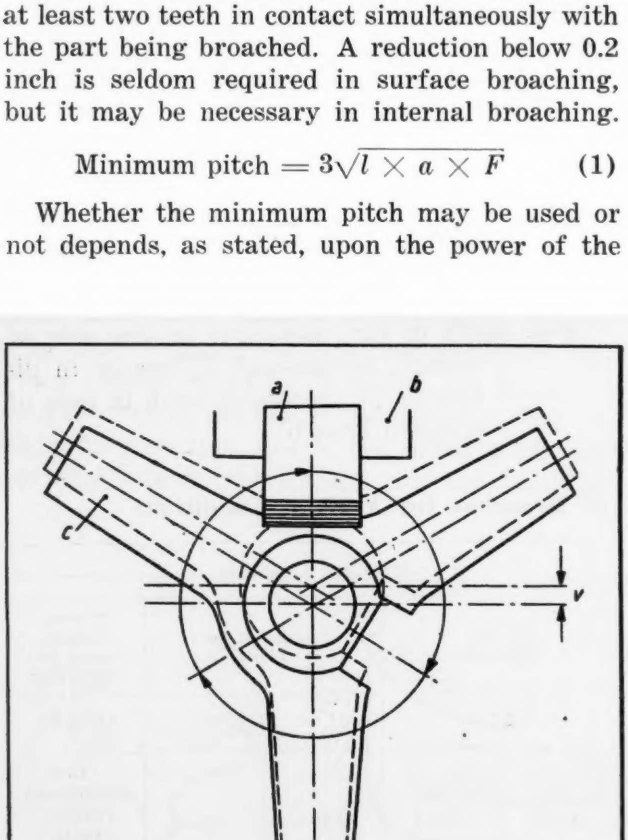


Fig. 11. Surface broaching by successive cuts of one broach, advancing the work-fixture between cuts. Cutting insert is shown at "a" and broach-holder at "b." Solid lines indicate the position of the work "c" at the first stroke and broken lines show its position at the second stroke. Advance of the work is indicated at "V"

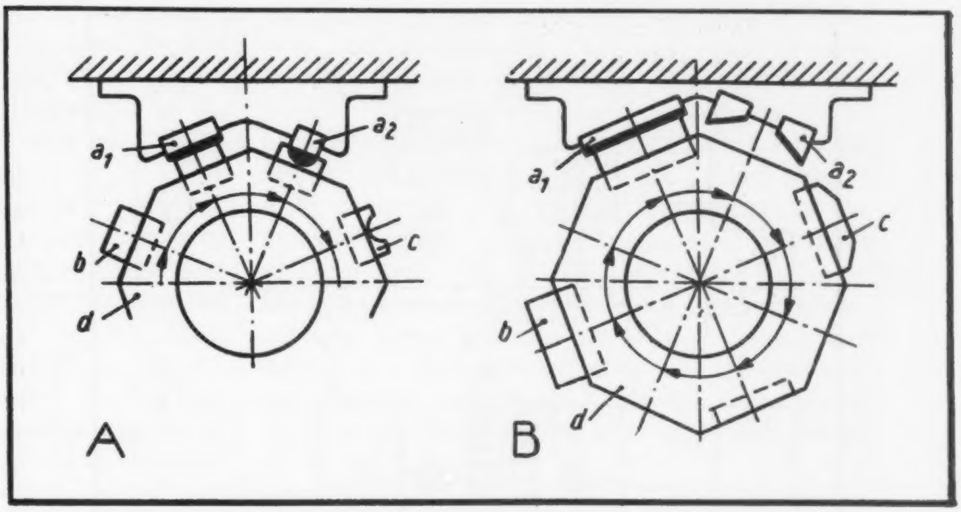


Fig. 12. Broaching in stages by indexing fixture "d" to bring work in contact with different broaches. Two broaches are shown cutting simultaneously at "A" and successively at "B." Cutting inserts are indicated at "a_1" and "a_2," and the work before and after being broached at "b" and "c"

sulting from the gradual dulling of the cutting edges.

The procedure in calculating both minimum and allowable pitches will be illustrated by an example.

Example—Determine pitch of broach for cast iron when $l = 9$ inches; $a = 0.004$; and $F = 4$.

$$\text{Minimum pitch} = 3\sqrt{9 \times 0.004 \times 4} = 1.14 \quad (1)$$

Next, apply Formula (2). Assume that $b = 3$; $T = 10$; and for cast iron and a depth of cut a of 0.004, $P = 115$. Then,

$$\text{Allowable pitch} = \frac{0.004 \times 9 \times 3 \times 115}{10} = 1.24$$

This pitch is safely above the minimum. If, in this case, the usable tonnage of an available machine were, say, 8 tons instead of 10 tons, the pitch as shown by Formula (2) might be increased to about 1.5 inches, thus reducing the number of teeth cutting simultaneously and, consequently, the load on the machine; or the depth of cut per tooth might be reduced instead of increasing the pitch, especially if only a few teeth are in cutting contact, as might be the case with a short length of cut. If the usable tonnage in the preceding example were, say, 15, then a pitch of 0.84 would be obtained by Formula (2); hence the pitch in this case should not be less than the minimum of approximately 1.14 inches obtained by Formula (1).

Reducing the depth of cut per tooth while retaining the minimum pitch, however, should be resorted to when only a few teeth can be put into cutting contact with the work part because of a small length of cut, or when slots or profiles are to be broached where no shear angle can balance the variations in load caused by teeth cutting and leaving the work part. This design adds to the cost of the tool and increases the cutting force. A broach designed in this manner should have a greater cutting length than one with a wider pitch and a deeper cut per tooth.

Another machine element that affects broach design is the maximum stroke of the tool-slide. When the cutting length of the broach is longer than the maximum stroke of the tool-slide, stock removal must be distributed on several strokes. This can be done by successive cuts either with the same broach (Fig. 11), or with a number of broaches (Fig. 12), which remove the stock in stages. When a single broach is used, the work-fixture is advanced after each stroke and set at different distances from the tool. When multiple broaches are used, an indexing fixture is employed to bring the work to the different broaches, as shown at *B*, Fig. 12.

Stock removal by successive strokes with the same tool is possible only when the shape of the work to be broached is symmetrical, and cannot be employed when broaching profiles. In using horizontal broaching machines or broaching presses for surface broaching operations, it is the only way to remove large amounts of stock for which the maximum stroke of the machine

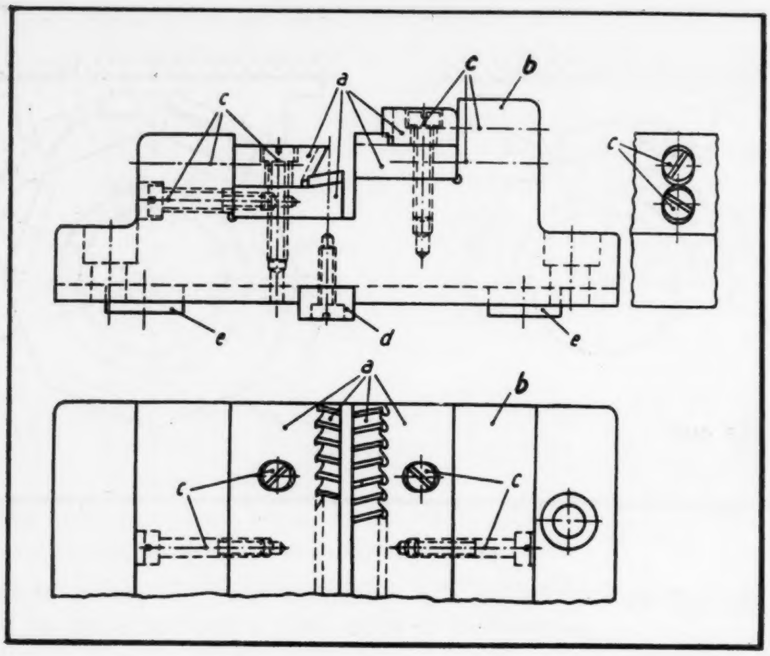


Fig. 13. Surface broach with four cutting inserts "a." Adjustment can be made by means of parallel shims inserted between the cutting blades and broach-holder "b." The fastening screws are indicated at "c," the fitting key at "d," and the keys for force transmission at "e"

is not sufficient. The bore of the faceplate in horizontal machines is seldom large enough to allow two broaches to be placed side by side, and the faceplate itself does not permit the setting up of an indexing fixture. The same lack of space is found in broaching presses. Vertical broaching machines offer more opportunity for using several broaches, as they have a broad tool-slide and a spacious work-table.

When the work to be broached is thin and long, only a few narrow teeth can be put into cutting contact at any given instant because of the large chip space required. As a result of this condition, the full power of the machine is not used, and therefore sufficient power is available to enable several broaches to be employed that will cut simultaneously, removing stock in stages from the work which is carried to the broaches by an indexing fixture, as indicated at *A* in Fig. 12. To take advantage of the available machine power, two different broaching operations are often performed simultaneously on parts of the same lot, and sometimes different parts are simultaneously machined by different broaches.

In dimensioning the cutting inserts and locating them on the broach-holder, consideration must be given to the methods to be used in machining the broach. For example, the form milling cutters used in cutting the teeth and the form grinding wheels used in grinding them must have unobstructed passage for entering and leaving the chip space. Because of this requirement, broaches having irregular contours should be made with several cutting inserts, so that the cutting edges of steep and shallow profiles are separate inserts. This practice is most useful where irregular profiles are to be ground and sharpened on the face of the cutting edges by placing the inserts between centers, and also where straight profiles are to be ground and sharpened on the face of the cutting edges by moving a grinding wheel in a straight line across the cutting insert.

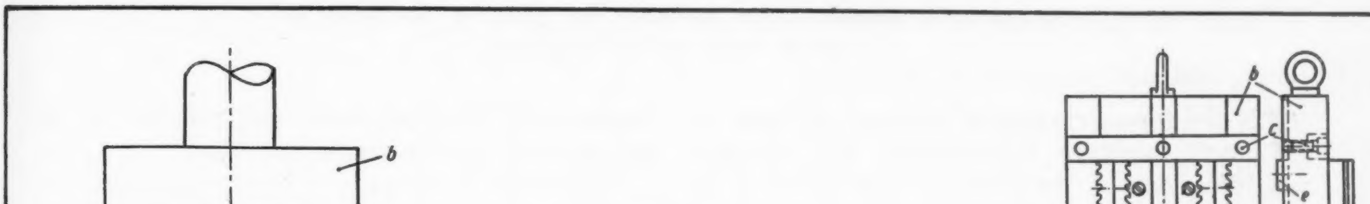
In a case, for example, where a sharp edge is formed by two surfaces to be broached, the problem can be solved by mounting two inserts side by side with the lateral ends of their teeth overlapping (Fig. 13); or by broaching the two surfaces successively during one stroke of the machine. This enables the inserts to be machined without difficulty. When broach inserts are located side by side, mounting them in such a way as to stagger the engagement equalizes the cut-

ting action, thus improving the surface finish of the work.

Distortion from heat-treatment must be considered in determining the length of broach inserts, and their length is also dependent on the type of broach grinding or broach sharpening machine which is available.

In a surface broaching tool, the broach-holder, broach inserts, joining elements, and adjusting elements are assembled to form a rigid unit, which should be able to sustain heavy forces but which can be easily disassembled for adjusting, sharpening, and changing the cutting inserts. The various parts are illustrated in Fig. 14, where broaches for three principal types of broaching machines are shown. At *A* is shown a push-broach for broaching presses. The cutting inserts are indicated at *a*, the broach-holder at *b*, hardened guiding ways at *c*, machine table at *d*, the top jaw of the clamp at *e*, and the bottom jaw at *f*. A pull-broach, used on horizontal broaching machines, is shown at *B*, where *a* indicates the cutting inserts; *b* the broach-holder; *c* the adjusting gibs; and *d* the faceplate of the machine. At *C* a broach for vertical machines is illustrated. The cutting inserts are indicated at *a*, the broach-holder at *b*, the key for transmitting force between the broach-holder and inserts at *c*, the clamping gibs at *d*, the positioning keys for the tool at *e*, and the force transmission key between the slide and the broach-holder at *f*.

Fig. 14. Broaches for the principal surface broaching methods include a push-broach "A" for broaching presses; a pull-broach "B" for horizontal broaching machines; and a broach "C" for vertical broaching machines



Accurate Form-Grinding of

Fig. 1. General view of grinding department, showing the optical comparators employed for checking the form of the grinding wheels right at the machine

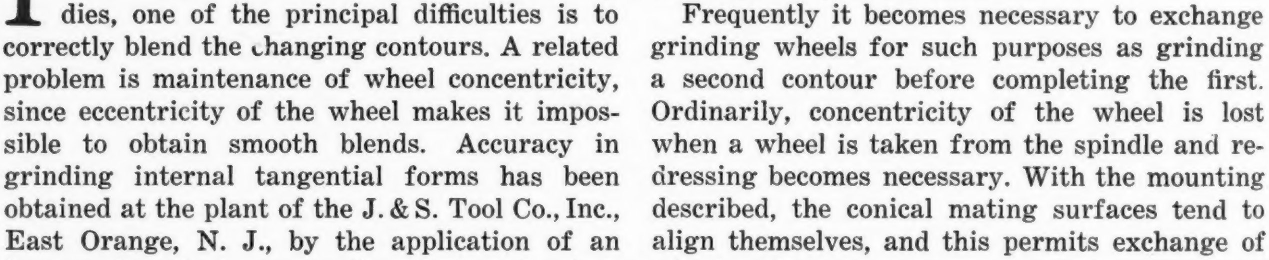
IN the form-grinding of internal surfaces on such work as cold-heading and forming dies, one of the principal difficulties is to correctly blend the changing contours. A related problem is maintenance of wheel concentricity, since eccentricity of the wheel makes it impossible to obtain smooth blends. Accuracy in grinding internal tangential forms has been obtained at the plant of the J. & S. Tool Co., Inc., East Orange, N. J., by the application of an improved method of mounting the small grinding wheels employed in such operations.

It will be noted from Fig. 2 that the shank of the grinding wheel has a taper just behind the wheel. This tapered surface seats in a similarly tapered bearing surface in the machine spindle adapter. Threaded engagement between the wheel shank and the adapter insures tight fastening of the two parts and permits quick exchange of grinding wheels.

Frequently it becomes necessary to exchange grinding wheels for such purposes as grinding a second contour before completing the first. Ordinarily, concentricity of the wheel is lost when a wheel is taken from the spindle and redressing becomes necessary. With the mounting described, the conical mating surfaces tend to align themselves, and this permits exchange of wheels without loss of concentricity. The neck diameter of the spindle adapter is made smaller than the wheel diameter to facilitate grinding deep internal forms. The length of the neck can be varied to suit conditions. Fig. 3 shows a group of typical wheels and adapters with necks of various lengths.

Correct contour of the grinding wheels is of

Fig. 2. Construction of grinding wheel shank and machine spindle adapter that has proved satisfactory in the grinding of internal forms with smooth blends



Internal Surfaces

By GEORGE H. DeGROAT and PAUL J. KOELBEL

paramount importance, and for this reason, a Jones & Lamson optical comparator for quick inspection of wheels is provided adjacent to each grinding machine, as shown in Fig. 1. It can be safely assumed that the internal form of the work-piece will be correct if the grinding wheel contour is in accordance with specifications. Therefore, the wheel and the spindle adapter for an operation are placed in a V-block stage on one of these comparators for checking the wheel contour at a magnification of 20X.

Faulty wheel dressing of small grinding wheels accounts for many difficulties encountered in internal grinding, such as short wheel life and poor quality work. It is therefore important that the wheel-dresser be rigidly supported and in proper relationship to the wheel. A dresser should be used that will insure accuracy of contours within 0.0002 inch.

Other important factors to be considered in setting up for internal form-grinding operations include method of holding the work, selection of proper grinding wheels, use of correct speeds and feeds, and condition of the machine.

Methods of Holding Work

For large cylindrical work, such as cold-heading dies, faceplate fixtures are employed on the grinding machines when the quantity of work warrants their use. One of these fixtures consists simply of a V-block of suitable size provided with a quick-acting clamp. This fixture is rigidly secured to the faceplate, and after being checked for concentricity and locked, it serves as an efficient means of holding work, since it can be loaded and unloaded quickly.

For grinding swaging jaws, which is generally done in pairs, a rectangular box type holder has been designed, which holds the jaws in a position that permits of grinding the swaging form simultaneously in two or more jaws.

In Fig. 4 a compound work-holding head is shown, in which such work as spiral form tools with internal contours can be held and the forms ground with small mounted wheels or carbide burrs. This work-head can be set at various angles in two planes.

The base *A* is clamped to the machine table and supports a graduated circular plate *B* which permits the work to be set at different angles in a plane parallel with the top of the table. An upright member *C*, fastened to plate *B*, carries a graduated support *D* for the work-holding sleeve *E*. By rotating the sleeve support the work can be set at various angles in a plane perpendicular to the top of the table. The work *F* is locked in an adapter *G*, which is free to rotate inside the sleeve. Fixed to the other end of the adapter is a cam *H* which imparts a spiral action to the tool when rotating against a stationary pin *J* in the sleeve. Raising and lowering of the work are accomplished by turning the micrometer feed-screw handwheel *K* which permits fine adjustments for setting the work.

Selection of Grinding Wheels

The selection of grinding wheels depends largely upon such factors as the material to be ground, amount of stock to be removed, accuracy and finish required, etc. In general, standard practice and the recommendations of grinding wheel manufacturers are followed in selecting wheels. For example, in grinding an internal form in a hardened tool-steel part or in a high-carbon, high-chromium die, a medium-soft, vitrified-bond aluminum-oxide wheel of medium grain size is used with good results. This type of wheel holds a dressed form well and provides a good finish. Finer and harder wheels tend to glaze and chatter, and are seldom used except when sharp corners, of 0.004 inch or smaller radius, are required.

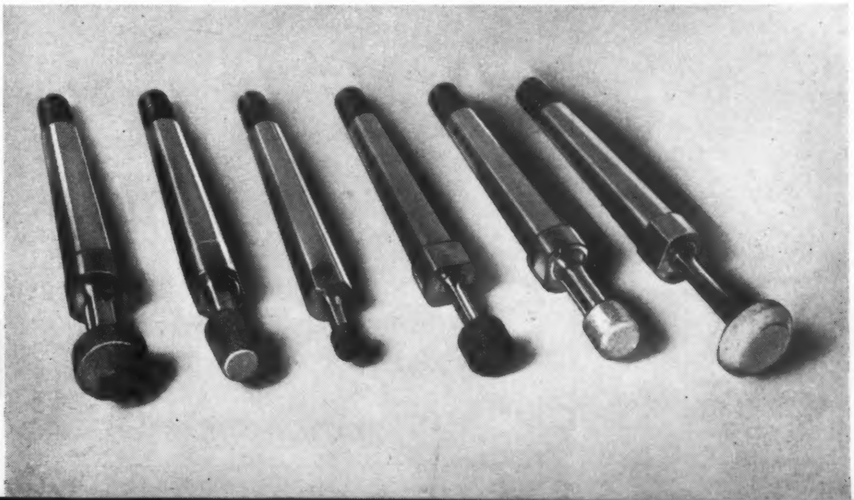


Fig. 3. Grinding wheels mounted in adapters of the type shown in Fig. 2 having necks of different lengths to suit depths of forms to be ground

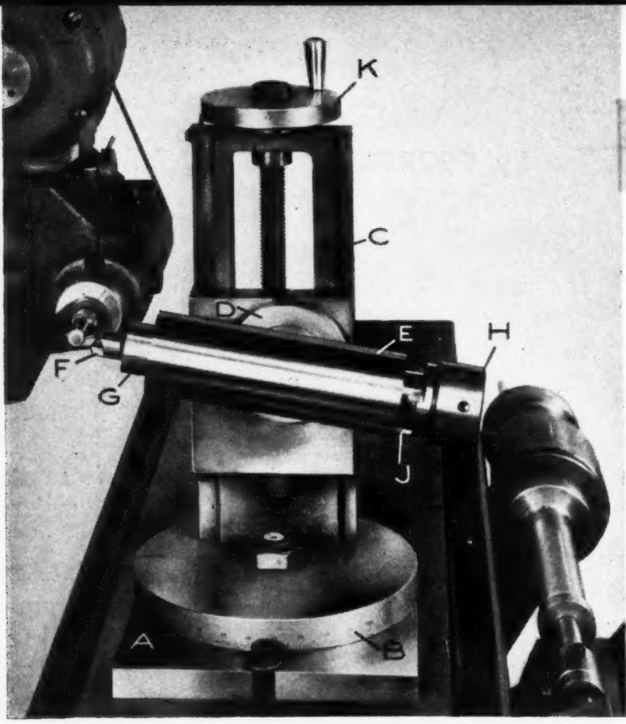


Fig. 4. A compound work-holding head for internal form-grinding of spiral form tools

When excessive stock must be ground off a part, as in instances where stock is left to permit correction of distortion due to heat-treatment, a coarse soft wheel is used for rough-grinding. Each job is considered in the light of its own conditions.

ACCURATE FORM-GRINDING

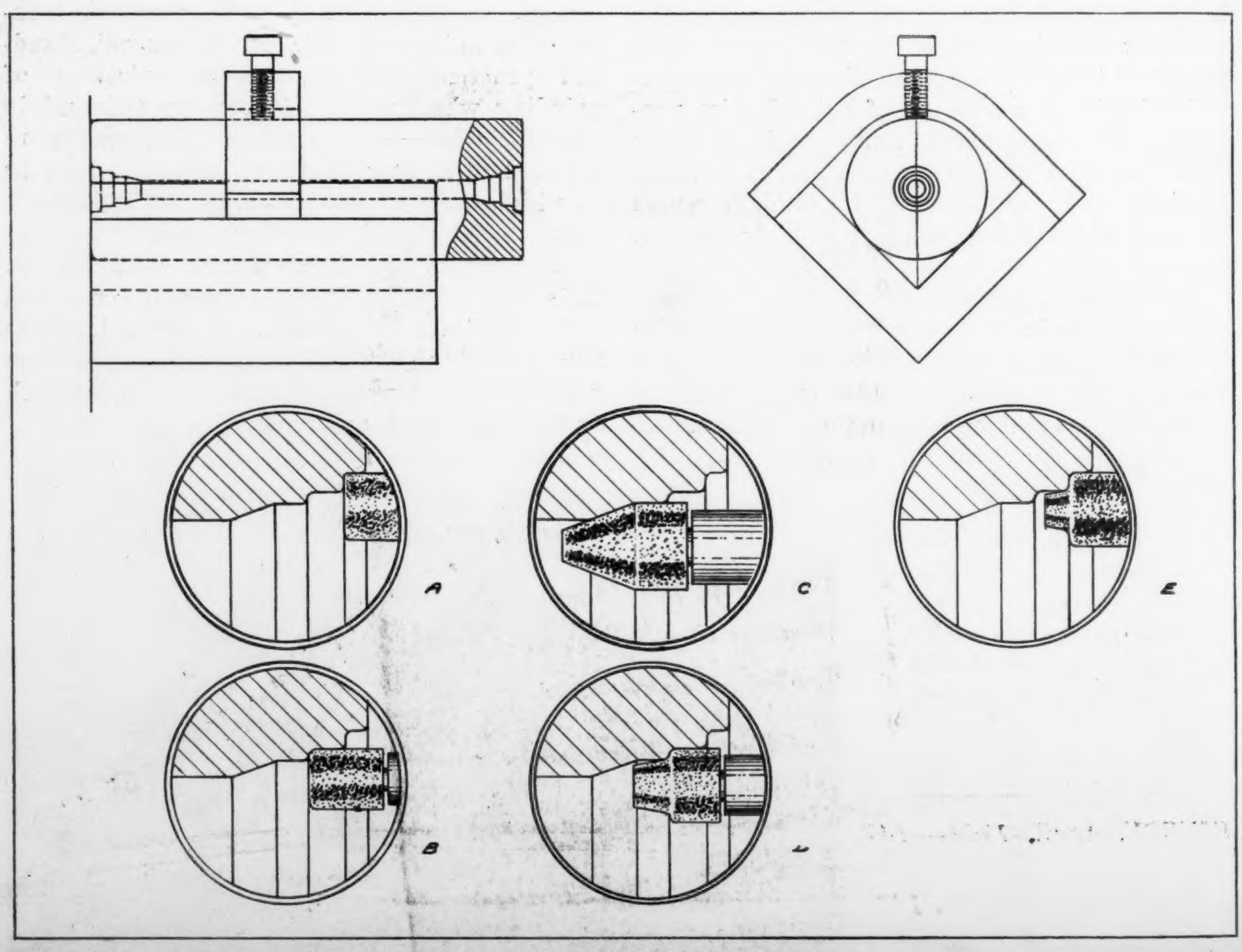
Correct Speeds and Feeds for Internal Form-Grinding

Standard practice and wheel manufacturers' recommendations also govern the selection of wheel speeds and feeds, and here, again, work conditions are important. Usually, the wheel speed falls in the range of 4000 to 6000 surface feet per minute, except in the case of very small wheels where this peripheral speed cannot always be obtained. Adjustment of the work speed is often found helpful in controlling the cutting action of the wheel, inasmuch as an increase in work speed tends to make the wheel break down faster and therefore cut more freely. Conversely, if the wheel is found to be breaking down too fast, decreasing the work speed gives it a harder action and helps maintain a dressed form.

Wheel in-feeds range from 0.010 to 0.0001

(Continued on page 164)

Fig. 5. Sketches illustrating the procedure followed in rough- and finish-grinding various internal contours of a cold-heading die



Business Has Nothing to Fear?

ONE of the most astounding bills ever introduced into Congress is the Administration's so-called Economic Stability Act of 1949, which carries the designation H.R. 2756. If this bill were to pass, the President of the United States would have the power to set maximum prices, to influence but not control wages, to allocate products, to make and forgive loans, and to construct manufacturing plants at Government expense whenever he, personally, felt that any of these actions was necessary to achieve quantity goals. Also, he would be authorized to control the level and distribution of incomes, products, and investments. He would have the power of economic life or death over regions, industries, businesses, unions, and individuals.

This bill would recognize four bases for granting wage increases—a higher cost of living, inequities in the wage structure, sub-standards of living, and the need to keep essential production going. In cases where wages were raised, a manufacturer would not be permitted to consider the wage rise as an increase in production costs for the purpose of adjusting price ceilings until six months after the effective date of the wage increase. Specifically, the bill reads: "This title (Title IV—Prices and Wages) is not intended to modify this policy, but rather to further the objective of preventing price increases which tend to destroy economic stability and correspondingly to destroy the value of the wage earner's dollar." Wages can go up, but not prices.

If the bill were to become a law, it would inevitably be administered under political pressure. Various sections of the country would clamor for steel mills, textile plants, automobile factories, etc., whether or not the proposed locations were suitable from an economic standpoint—and they would get them, too. There would be demands for price regulations on steel, machine tools, and every conceivable product.

This bill would make the President a dictator of our economy and hinder our economic progess, which even his Secretary of Commerce says has been motivated by the desire of American businessmen to make a profit. The Secretary has pointed out that the profit system has worked and must be preserved—the Economic Stability bill would not serve that purpose. Whatever is detrimental to business is detrimental to the employes, as well as to the owners.

This ill-advised measure will probably not be passed in its entirety by the present Congress because there are apparently a sufficient number of conservative members to block the enacting of out-and-out radical legislation. But everyone who believes that the free profit system should be preserved must be on guard. Ever since the presidential election last November, the Administration has been telling business that it has nothing to fear. But when such industry-hampering legislation is seriously proposed, business has plenty to fear.

Charles O. Herb

EDITOR

Automatic "Rough-Finish" Cycle

WITH costs of material and manpower continuing to climb, manufacturers of metal products are redoubling efforts to improve upon machining operations wherever practicable. No opportunity that offers promise of effecting economies in time and money without sacrificing quality can be overlooked. Of timely interest in this connection is a new variation of the Mona-Matic engine lathe built by the Monarch Machine Tool Co., Sidney, Ohio, which is making it possible for a Midwest manufacturer to increase his production of bronze and cast-iron sleeve bearings by as much as 700 per cent.

At this plant, two "rough-finish" cycle Mona-Matic lathes are employed to finish the bearings. The first machine, Fig. 1, rough- and finish-bores and faces one end of the rough bushing. The second machine rough- and finish-turns the outside diameter and, at the same time, faces the other end of the bushing.

The rough-finish cycle is completely automatic, requiring only that the operator load the machine, start the cycle, and remove the machined part. This makes it possible for one man to operate two machines, thereby doubling the output per operator. Separate tools are used for roughing and finishing, so that dimensional accuracy and concentricity, established by the finishing tool, may be held over a longer productive period.

The cycle in machining one particular size bushing having an inside diameter of 2 1/4 inches, an outside diameter of 2 1/2 inches, and a length of 3 inches is described in the following. The bushings are made from general-purpose bearing bronze, similar to S A E 660, with a hardness of 80 Rockwell B.

After inserting the bearing in the foot-pedal-controlled air chuck of the first machine, Fig. 2, the operator pushes the start-cycle button and work rotation starts. The spindle speed for this bearing is 1000 R.P.M. The carriage, on which is mounted a two-station air-indexed boring-bar, seen at the right, is fed by rapid traverse to the work. A moment before the cut begins, the rapid traverse changes to a roughing feed of 20 inches per minute, or approximately 0.020 inch per revolution. The tool completes the roughing cut at this rate, removing about 1/8 inch of stock per side.

When the boring tool reaches the left end of the bushing, the work speed is increased, the boring-bar is indexed to bring the finishing tool into position, and the carriage is fed to the right. The finishing cut, which removes about 0.010 inch per side, is made at 1500 R.P.M. with a feed of 7 1/2 inches per minute, or approxi-

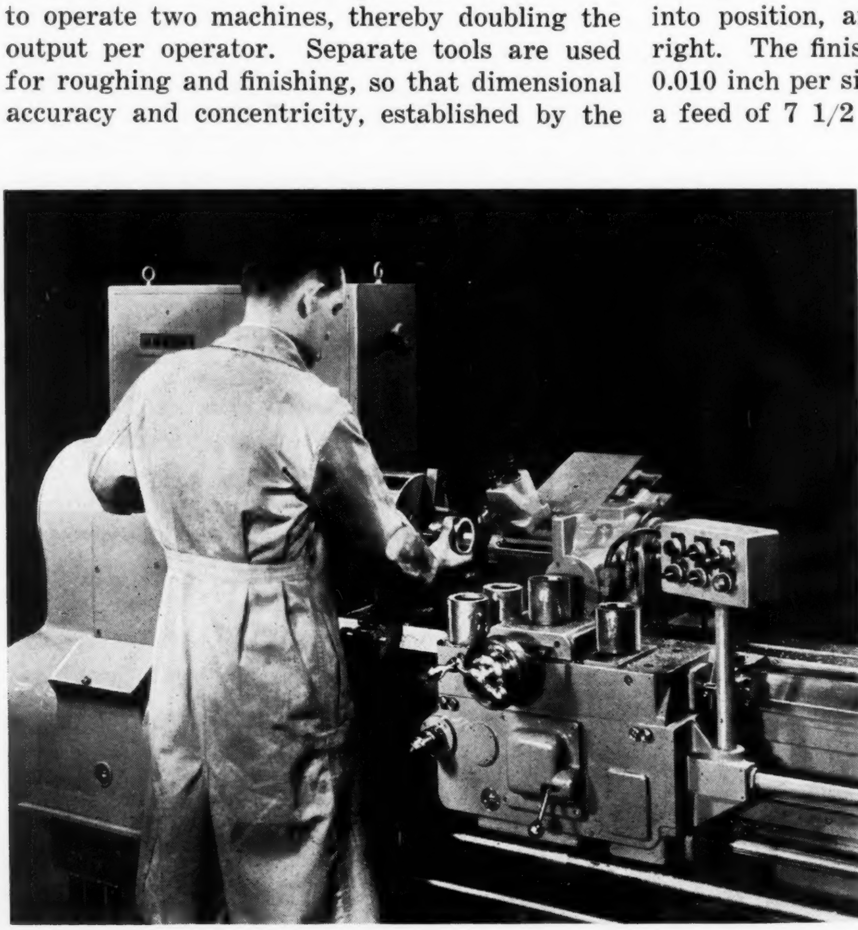


Fig. 1. Operator is shown removing a rough- and finish-bored and faced bushing from a lathe having an automatic rough-finish cycle

Cuts Costs of Machining Bearings

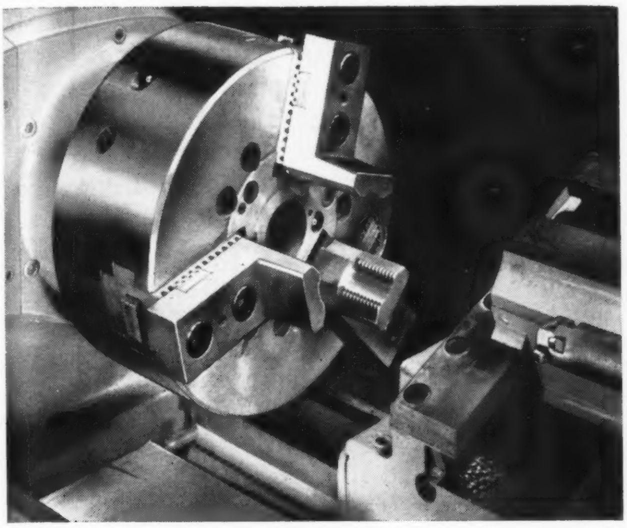


Fig. 2. Close-up view of the air-operated chuck used to hold the bushing for rough- and finish-boring and facing of one end. Both boring tools are visible in the boring-bar at the right

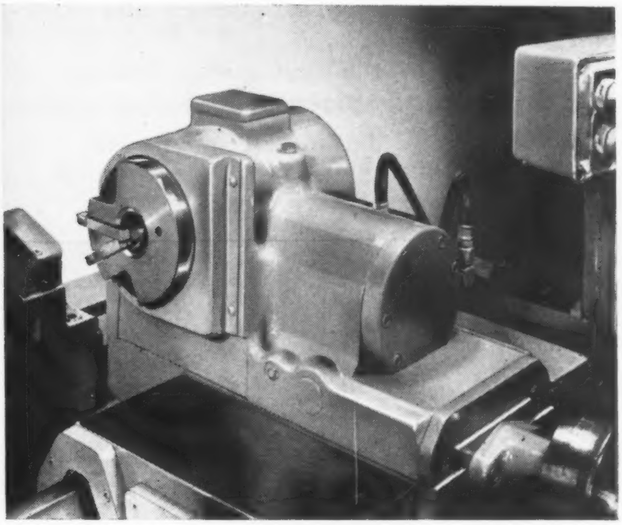


Fig. 3. Close-up view of tooling for rough- and finish-turning sleeve bearings. At end of roughing cut, speeds and feeds change automatically, tool is indexed, and carriage is fed back for finishing cut

mately 0.005 inch per revolution. During the boring cycle, a rear slide is fed toward the work, the end of the bushing is faced, and the slide returned to its starting position. About 1/16 inch of stock is removed from the end of the bushing during the facing cut.

Upon completion of the finishing cut, the carriage feed again changes to rapid traverse and the carriage returns to its starting position. During this time, the boring-bar indexes the roughing tool into position, the spindle stops, and the operator unloads the machine, loads another rough bushing, and restarts the cycle.

The partially completed bushing is turned end for end and placed on the air-operated arbor of the second machine. An air-operated, two-station tool-block, Fig. 3, is mounted on the carriage of this machine. Again, two tools are used, one for rough- and one for finish-turning. The second machine faces the end and rough- and finish-turns the outside diameter of the bushing in a cycle exactly like that of the first unit.

The cycle is completely automatic in both cases. The operator merely loads the machine and starts the cycle. All the tools employed are single point, carbide tipped, and ground to a standard form having a positive back rake of 5 degrees, a side rake of 3 degrees, side relief angle of 3 degrees, side clearance angle of 7 degrees, and a front or end relief of 3 degrees. The front clearance angle is 7 degrees on the turning tools and 20 degrees on the boring tools.

Power for carriage traverse and feed is supplied by an electronically controlled motor driving the feed-rod through a gear-box. The speed of this motor, and therefore of the carriage, is pre-selected during the machine set-up. Potentiometers are used to set the feed rate anywhere in a stepless range from 1/2 inch to 20 inches per minute. Separate controls are provided for the roughing and finishing feeds. Selection of the exact feed desired is made easy by a feed meter, calibrated in inches per minute.

The rear slide is powered by a motor and control similar to that used for the carriage. The motor is housed in the slide base and provides a stepless feed range of 3/8 inch to 13 1/2 inches per minute. Potentiometer control is used for feed selection. Rapid traverse for both front and rear tools is fixed at 100 inches per minute.

Spindle speeds are also controlled by a potentiometer through a stepless range of 350 to 2400 R.P.M. This makes it possible to select the combination of feeds and speeds best suited to any job. Adjustable stops are mounted on the bed to control the points at which rapid traverse changes to rough-feed, rough-feed to finish-feed, and finish-feed to rapid traverse. These stops also determine the timing of changes in spindle speeds.

In the case of this particular bearing, a total of only 0.85 minute is required to completely finish each part as described. Previous machin-

ing time for the same part was 5.41 minutes. Both lathes are set up in twenty minutes, whereas the former machines required nearly two hours. The automatic cycle can profitably be applied to both high-production and small-lot runs.

In addition to the time-saving features of these machines, the concentricity is held within

Typical Production Time for Machining Bronze Sleeve Bearings

Bearing Size, Inches			Production Time, in Seconds, for Various Phases of the Cycle		
Inside Diameter	Outside Diameter	Length	Rough- and Finish-Bore and Face on One Machine	Rough- and Finish-Turn and Face on Second Machine	Complete Cycle for Finishing One Bearing on Two Machines
1 1/2	1 3/4	2	28	30	30
1 1/2	2	4	50	54	54
1 3/4	2	3	42	44	44
1 3/4	2 1/4	3 1/2	47	53	53
1 7/8	2 1/2	5	64	71	71
1 15/16	2 3/16	2	34	35	35
2	2 1/4	2	34	35	35
2	2 1/2	6	85	91	91
2 1/8	2 1/2	3	49	52	52
2 3/16	2 11/16	3 1/2	55	64	64
2 1/4	2 3/4	4	63	72	72
2 1/2	2 3/4	1 1/2	34	37	37
2 3/4	3 3/8	4 1/2	80	97	97
3	3 1/2	4	78	89	89
3	4	5	94	120	120
3 1/4	4	6 1/8	116	140	140
3 1/2	4 1/4	4 1/2	98	116	116
3 3/4	4 1/2	6 1/2	143	164	164
4	4 1/2	6	142	161	161
4 1/4	4 1/2	4 3/4	123	126	126

Depth of Cut: Roughing, 1/8 to 3/16 inch per side; finishing, 0.010 to 0.015 inch per side; facing, 1/16 inch per end.

0.0005 inch. The accompanying table lists performance figures for a variety of bronze bushing sizes. Cast-iron bearings are handled just as readily and at comparable speeds. Of particular interest are the figures in the last column of this table, which show total machining time per bushing per operator.

* * *

Motor vehicles were introduced in Europe almost one hundred years before they appeared in the United States. Today, however, Americans have nearly four out of every five passenger cars in existence, and more trucks and buses than the rest of the world combined. There is one passenger car for every five persons in the United States, while the rest of the world has one passenger car for every 231 persons.

Program for Westinghouse Machine Tool Electrification Forum

The 1949 Westinghouse Machine Tool Electrification Forum will be held in Buffalo on April 26 and 27. Sessions on the first day will be held in the Hotel Statler, and on the second day at the Westinghouse Buffalo plant.

Technical papers to be presented at the first session include "Automatic Piston-Ring Machine," by L. A. Liefer, Gisholt Machine Co., Madison, Wis.; "High-Frequency Systems for Machine Tools," by LeRoy Morrill, Heald Machine Co., Worcester, Mass.; "Bonded Resistance Wire Strain Gages as Components of Machinery and Gage Equipment," by George Levesque, Brown & Sharpe Mfg. Co., Providence, R. I.; and "R-F Heating of V-Ways," by Messrs. Alcorn and Hatchard, of the Chambersburg Engineering Co., Chambersburg, Pa., and the Westinghouse Electric Corporation, respectively.

In the afternoon session of the first day, there will be an open forum discussion led by D. W. McGill, of Westinghouse Electric Corporation, assisted by R. H. Clark, Warner & Swasey Co.; E. J. Rivoira, Cincinnati Milling Machine Co.; and John Doran, G. A. Gray Co. There will also be a report of the Electrical Committee of the National Machine Tool Builders' Association presented by the committee chairman, W. B. Wigton, Cincinnati Planer Co.

At the second day's session, the adjustable voltage AV drive will be demonstrated by E. H. Vedder, Westinghouse Electric Corporation. In addition, papers will be presented by Westinghouse engineers on the following subjects: "Machine Tool Control Transformer"; "Electrical Braking for Induction Motors"; and "Adjustable Speed Saturable Reactor Drive." The Forum will be concluded with a dinner, at which the principal speaker will be Tell Berna, general manager of the National Machine Tool Builders' Association.

* * *

The American Standards Association has adopted three standard sizes for the publication of its standards. Prior to this, American Standards were published in some twenty different sizes by the many national organizations that are active in the standardization program. The three sizes now adopted by the Association are 8 1/2 by 11 inches for pamphlets; 6 by 9 inches for books; and 5 1/4 by 7 3/4 inches for pocket-size books.

Composite Dimensioning for Concentricity

By J. T. BENNETT, Engineer
North American Aviation, Inc.

Incorporating the Diametral and Eccentricity Tolerance in One Dimension Results in Increased Production and Fewer Rejected Parts

IN dimensioning machine parts, the aim of the engineering department is to specify dimensions and tolerances that will result in the maximum production efficiency consistent with correct functioning of the part. The aim of the manufacturing department is to produce parts to dimensions within the specified limits, taking maximum advantage of tolerances. Composite dimensioning can be employed to meet both these ends under certain conditions.

In composite dimensioning of holes and mating shafts, an allowance both for clearance and the maximum permissible eccentricity is combined into one tolerance on the diameters of the hole and shaft. This method has many advantages over the ordinary dimensioning procedure, which involves first locating the shaft with respect to the hole within tolerance limits, and then dimensioning both the hole and the shaft for concentricity. Composite dimensioning is advantageous for parts, the eccentricity of which is critical only as it affects subsequent assembly; it cannot be used in those cases where eccentricity would affect the operation.

Fig. 1 shows a simple stepped shaft and mating stepped hole. Although both of these parts could probably be produced with little or no eccentricity, it will be assumed that concentricity is difficult to maintain between the 1- and 2-inch diameters on both the hole and shaft, so that the shop requests a permissible eccentricity of 0.002 inch total indicator reading.

When this part is designed, the engineer may make a sketch as shown in Fig. 2, in which the proportions of the assembly are exaggerated to visualize the effect of eccentricity while determining the working dimensions. The 0.002 inch eccentricity allowance for each part is resolved into two tolerances consisting of 0.001 inch eccentricity in opposite directions for the smallest hole and the largest shaft. The 1.499 inch dimension between critical surfaces is common to both parts, and is assurance that no interference can occur even with the most adverse accumulation of tolerances.

One set of dimensional limits now being established, the other set is determined by subtracting the maximum permissible clearance from the maximum hole diameters to obtain the minimum shaft diameters. In this case, the shaft diameters would be 0.997 and 1.997 inches; a working drawing showing these dimensions is not necessary. This step gives the maximum clearance between the largest hole and the smallest shaft with no eccentricity. Diametral limits and eccentricity tolerances are then placed on a production drawing, as shown in Fig. 3.

A comparison of Figs. 1 and 3 will reveal that

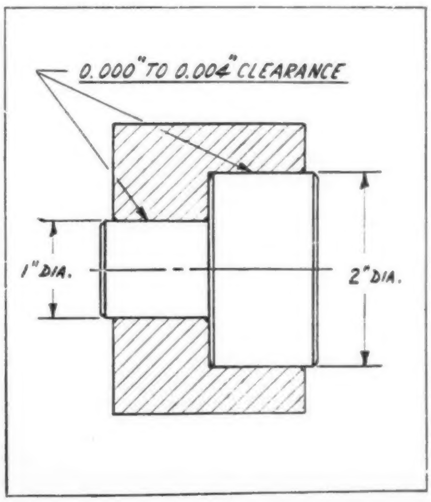


Fig. 1. Design drawing of a simple stepped shaft and mating hole. It is assumed that the maximum clearance between the parts is 0.004 inch and that eccentricity between the large and small diameters must be held within 0.002 inch total indicator reading

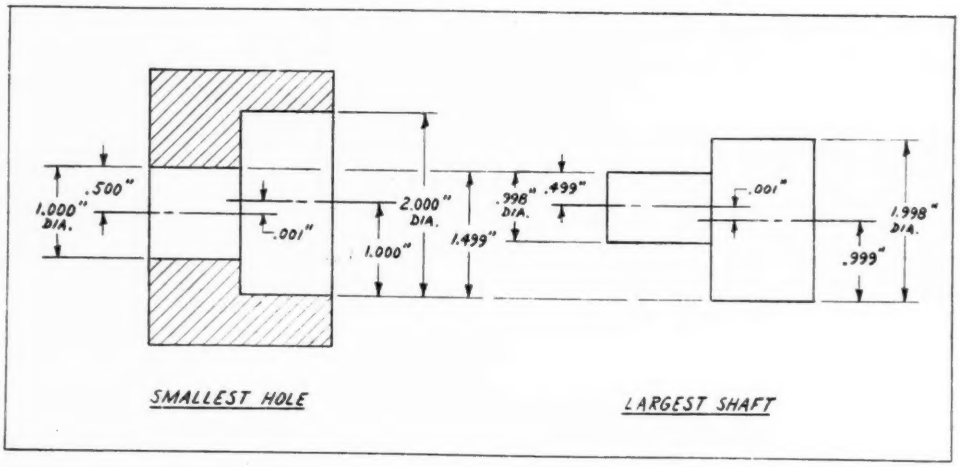


Fig. 2. The first step in dimensioning by conventional methods is to determine the minimum clearance between the smallest hole and largest shaft, taking into account an allowance for eccentricity

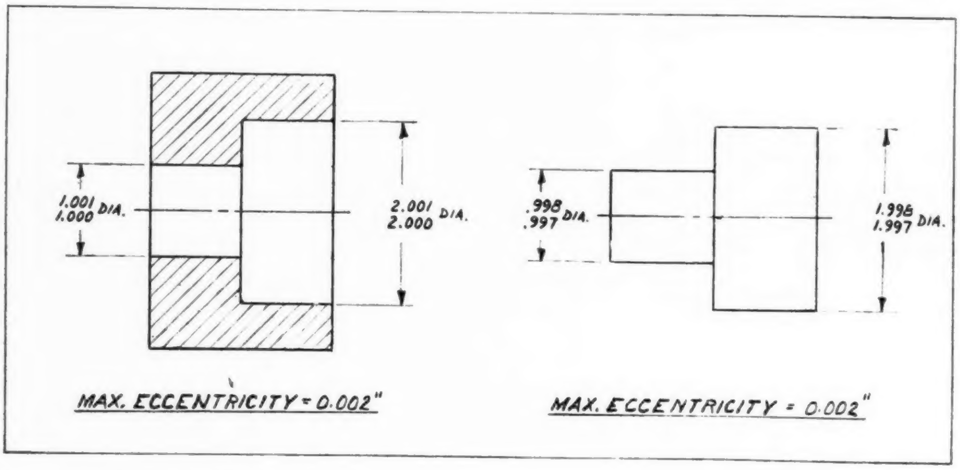


Fig. 3. A working drawing of the part is then sent to the shop. Since clearance and eccentricity are indicated separately on each part, separate tolerances are less than tolerance allowed by design drawing

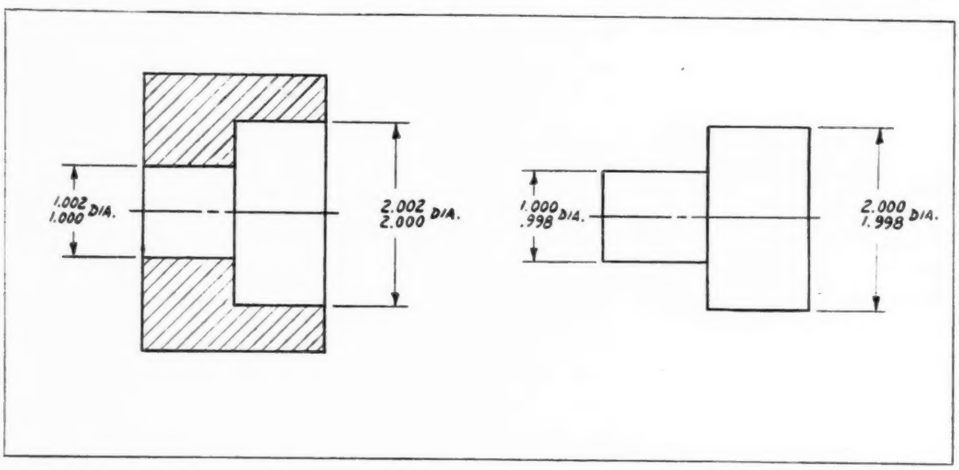


Fig. 4. When composite dimensioning is employed, full design tolerance becomes available to the shop. In this drawing, the tolerances include an allowance for clearance and eccentricity

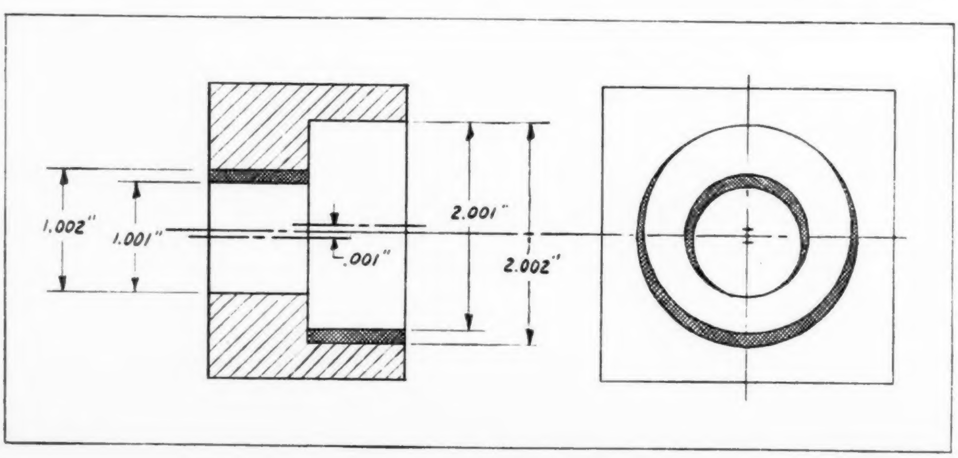


Fig. 5. The shaded portion of this drawing indicates the additional manufacturing tolerances available with composite dimensioning. The result of this technique is higher production, fewer rejected parts and simplified inspection

0.004 inch total diametral tolerance was originally available for the production of hole and shaft, but only 0.001 inch is now allowed for the hole and 0.001 inch for the shaft, the remaining 0.002 inch being reserved for eccentricity.

The realization that much production effort is being lost in maintaining unnecessarily close tolerances should be disturbing to the engineering and production man alike. The inspection of parts to the dimensions shown in Fig. 3 must necessarily be based on separate measurements of diameter and eccentricity, a total of five operations on each piece. Rejections will include some shafts and holes that are slightly over diametral tolerances but nearly concentric, and others that are slightly over the run-out tolerance but well within diametral tolerances. These parts are within the over-all specification limits, and are, in fact, superior to some of the parts that will be accepted without question.

In all fairness to the inspection department, it should be noted that the rejection of parts in this instance is justified by the circumstances. The use of separate diametral and eccentricity dimensions is necessary in some cases, and engineering is not a function of the inspection department. Parts must therefore be inspected to the dimensions specified.

In Fig. 4 is shown a working drawing to which composite dimensioning has been applied. Although some of the diametral limits do not tally with those in Fig. 3, careful comparison will show that when eccentricity is considered, the total effect of the two methods on the design is the same. Inspection of parts to the limits shown in this illustration is rapid and positive. The hole may be checked for maximum diameters with individual "No Go" plug gages, as in the former method, but the checking of the two minimum diameters and the eccentricity allowance can be done in one operation by means of a step "Go" plug gage. The shaft may be similarly checked using ring or snap gages. Thus, two gaging operations and the time-consuming job of measuring eccentricity have been eliminated on each piece.

The major advantage of this method of dimensioning is the increased tolerance allowed in manufacturing and the choice of the proportion of total tolerance to be used for eccentricity. This is graphically illustrated in Fig. 5, where the maximum hole dimensions used with the two methods are shown exaggerated and superimposed. The shaded areas portray the additional manufacturing tolerance available through the use of the composite limit.

Thus, composite dimensioning results in fewer rejected parts, speeds up production in the shop,

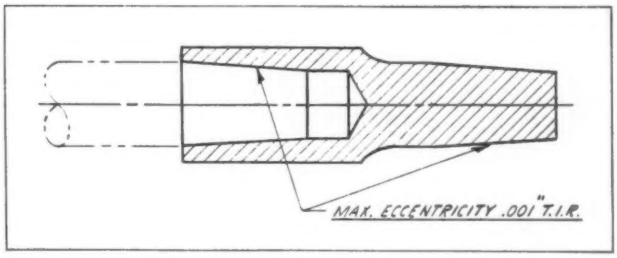


Fig. 6. Composite dimensioning can be used whenever eccentricity does not affect the operation of the part, but should not be employed in cases where concentricity is essential, as in this shaft extension

and simplifies the work of the engineer, since calculations separating eccentricity in clearance allowances are not necessary. Many production drawings may profitably be examined for possible use of composite dimensioning.

For designs where concentricity is a basic engineering requirement, however, diametral and eccentricity tolerances must be kept separate. An example of such a design is the shaft extension shown in Fig. 6. Here a tight fit is insured by the use of tapered surfaces, and it is important that the shaft extension run true with the main shaft within the allowance noted.

* * *

British Industries Fair

The British Industries Fair, an annual event held in London and Birmingham, England, will take place this year on May 2 to 13, inclusive. Trade buyers from over a hundred countries gather at this fair each year. The exhibitors, of which there are 3000, include only those manufacturers whose factories are located in the United Kingdom, and cover practically all manufacturing industries. Among the groups in the engineering section, exhibiting at Birmingham, will be manufacturers of die-casting machines, electronic devices, mechanical-handling appliances, plastic molding machines, tools, and many other lines. Further information can be obtained from the British Information Services, 30 Rockefeller Plaza, New York 20, N. Y., or from any British consulate.

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According to the National American Legion Commission, the United States, with only 7 per cent of the world's population, has 83 per cent of the world's automobiles, 86 per cent of the refrigerators, 67 per cent of the vacuum cleaners, and 79 per cent of the radios.

Engineering News

Huge Welded Marine Gear Made to Close Tolerances

A 7 1/2-ton bull gear, one of two required to drive a large marine ore-carrier, is shown in the illustration being fabricated at the Sunnyvale, Calif., works of the Westinghouse Electric Corporation. The two gears are in the final stage of a series of gears that take the full load of a 7000-H.P. marine turbine propulsion unit and reduce the speed from 6000 to 100 R.P.M. for the propeller shaft. The hub is being welded to one of the center plates that form the sides of the gear. Flux is fed automatically as the gear turns slowly under the welding machine.

This bull gear is made from two kinds of steel. The rim, which is welded to the sides, is of high-carbon steel and is hobbed later into 693 helical teeth. The teeth must withstand great pressures under continuous operation. The hub, center plates, and ribs are made from mild or medium-carbon steel.

Despite its size and ruggedness, each bull gear must be made to extremely close tolerances. As the slightest inaccuracy in the teeth will cause excessive vibration and noise when the gear is installed in the ship, inspection is rigid and any imperfection, however small, will cause rejection. Tolerances for the helical teeth cut in the rim are as close as 0.0001 inch.

Uniform Stiffness of Strip Steel Insured by New Instrument

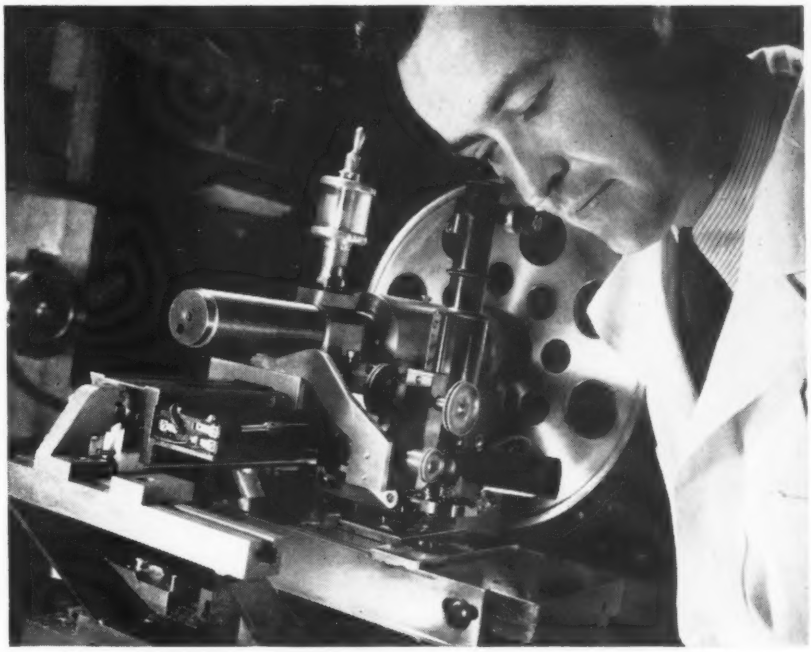
A new device known as a temper mill extensometer has been developed by research technologists of the Carnegie-Illinois Steel Corporation and the United States Steel Corporation to insure uniformity in stiffness of rolled strip steel. This instrument is employed to control temper rolling, and can be used to feed the strip at speeds as high as 2000 feet per minute.

The strip steel used in tin cans must be stiff enough to withstand rough usage and support heavy loads. This device insures that steel for cans of the same design will be of uniform stiffness, and permits rolling strip steel of varying stiffnesses for cans of different sizes and shapes.

University of California to Install World's Largest Atom Smasher

The most powerful atom smasher in the world is being constructed for the University of California. The new machine will be seventeen times more powerful than the university's present cyclotron, which is the largest known to exist today. The electrical equipment for this huge atom smasher is being built by the Westinghouse Electric Corporation. It consists of

Welding one of two large bull gears required to drive the propeller shaft of a ship at the Westinghouse Electric Corporation's plant in Sunnyvale, Calif.



A ruling machine that can cut up to 10,000 lines per inch in gold master blocks has been developed by the General Motors Research Laboratories for use in the production of accurately ruled geometric surface-finish specimens. The lines are produced by a fine diamond cutter and are observed through a microscope

two alternating-current motor-generator sets that develop 100,000 kilowatts of power, ignitrons to change alternating into direct current, and a network of controls and meters to channel the power into a 10,000-ton circular steel magnet.

In a rectangular "tunnel" in the giant magnet, sub-atomic particles called protons will be accelerated electrically until they travel at nearly the speed of light. The protons will then be "fired" into a block of graphite, or compressed gas, smashing the atoms in the material and releasing electrons, neutrons, protons, and mesons which can be photographed for later study.

Instrument for Measuring Stress in Electrodeposits

In recent years there has been a growing realization of the importance of internal stress in the performance of electrodeposited coatings and in the quality of plated articles. Excessive stress may cause peeling, blistering, or cracking of the coating, and thus render the base metal more susceptible to corrosion, which may result in failures. It also tends to decrease the fatigue resistance of the plated article.

A convenient and accurate method of measuring stress in electrodeposits has been developed by the National Bureau of Standards. It consists of a direct-reading instrument, known as a spiral contractometer, which is adapted for both industrial process control and laboratory research. By the use of this instrument, compression or tension in a specimen coating deposited on a helically wound metal strip can be immediately read on a dial as the helix changes curvature in response to forces acting within the plated layer.

Essentially, the new instrument consists of a flat metal strip wound in the form of a helix and mechanically connected to the pointer of a dial on which the rotation of the free end of the strip with respect to its fixed end is indicated. The helical strip is connected at its upper, fixed end to a negative lead and suspended vertically in a plating solution along with a suitable anode. As it is plated with a sample coating on the outside only, the stress in the deposit causes it to wind more tightly or to unwind, depending on whether the stress is compressive or tensile.

A rod running down the axis of the helix is attached to the lower or free end of the strip, so that rotation of this end due to stress is transmitted to the rod. The movement of the rod, in turn, is transmitted to a gear train which produces a tenfold magnification in the rotation of the dial pointer. The angular displacement of the rod is read directly on the dial, in degrees, and converted to units of stress on the basis of the calibration of the helix used.

Stress determinations made with the spiral contractometer on nickel deposits can be reproduced within 10 per cent. In addition to having greater sensitivity than methods ordinarily employed, the contractometer is easily calibrated, thus simplifying calculations and eliminating errors due to variations in the physical properties of the helix. The use of a coiled strip also reduces errors caused by transverse bending.

Making Aluminum Furniture

Fig. 1. Extruded aluminum tubing of rectangular cross-section being formed into furniture frames on hydraulic bending machine

LARGE quantities of aluminum extrusions, in a wide variety of cross-sections, are used in the mass production of aluminum furniture at the plant of the Reynolds Metals Co., Louisville, Ky. The combination of light weight, strength, and pleasing appearance inherent in aluminum makes it ideally suited for such products. Adequate supply and the fact that aluminum is one of the few basic materials that are cheaper today than before the war are other reasons for its popularity.

The surface of extruded tubing used in making aluminum furniture is generally grained or polished before forming. Hydraulically operated bending machines are employed, as shown in Fig. 1, to form the tubing into frame, leg, and arm members. Lubricant is applied to both inner and outer surfaces of the tube before bending to minimize friction between the die, flexible mandrel, and tube. After being formed, the parts are placed in open-side containers and lowered into a vapor degreaser, such as illustrated in Fig. 2, to remove the lubricant.

The parts are then drilled for assembly. A special set-up employed for drilling twenty-two holes, 3/16 inch in diameter, in the main frame of a chaise longue in a single operation is shown in Fig. 3. Twenty-two pneumatic drills are mounted in a vertical position on top of a fixture that accurately locates the work in the drilling position. With the work in place, the operator presses a button that actuates an air cylinder under the fixture. This cylinder lifts the tubular aluminum frame up against the rotating drills.

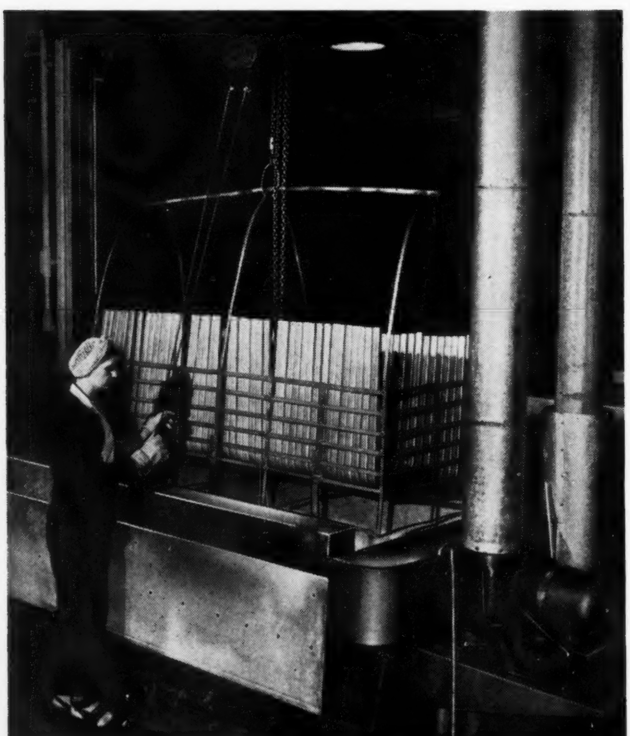
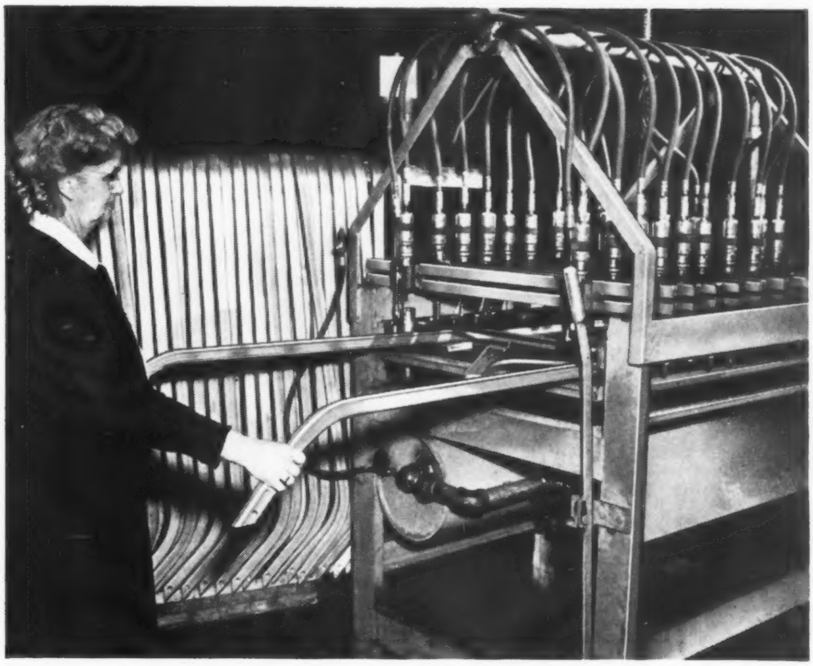


Fig. 2. Formed aluminum furniture frames being lowered into a vapor degreaser to remove lubricant applied for the bending operation

from Extruded Tubing

Fig. 3. Special set-up in which twenty-two pneumatic tools are used to drill the main frame of a chaise longue in one operation



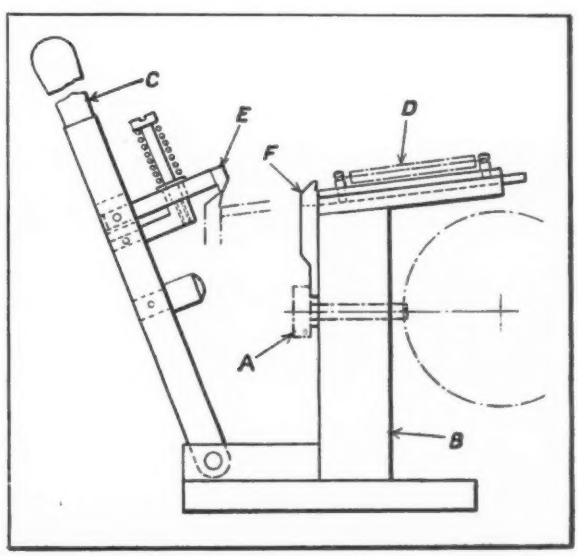
After being drilled, the frame is automatically lowered and the operator simply withdraws it from the fixture, as shown. Two air jets, one directly in front of each row of drills, blast chips from the drilled holes as the frame is being removed. A production rate of more than two hundred frames per hour is obtained by the use of the set-up described.

Slot-Milling Fixture with Automatic Ejector

The fixture shown in the accompanying illustration was designed to be used on a high-speed milling machine for milling slots in 3/16-inch diameter brass rods. Since the production time had to be kept as low as possible, the fixture was equipped with an automatic ejector.

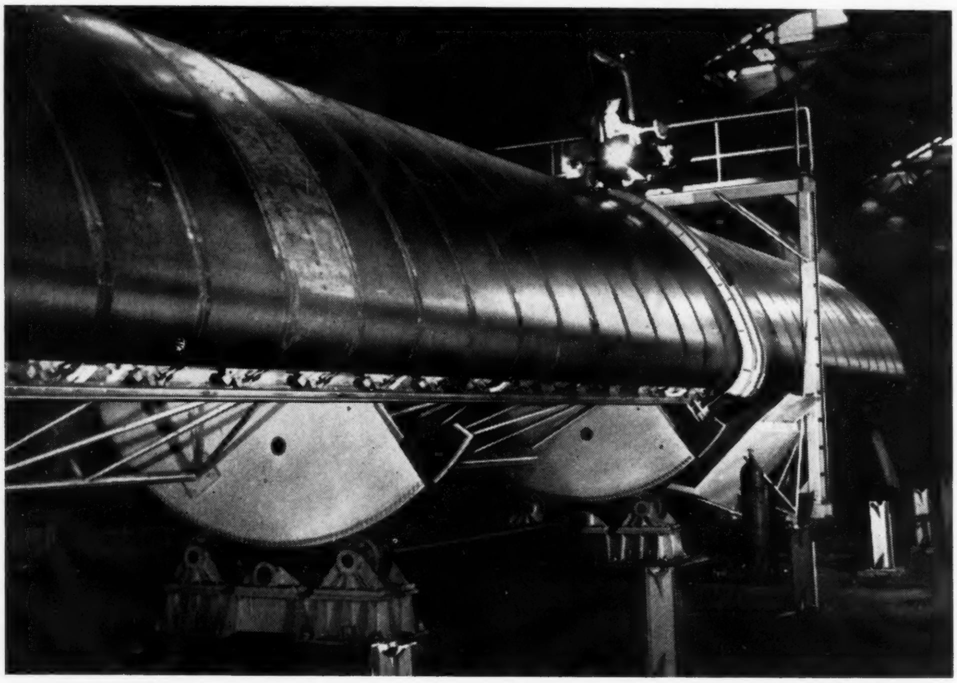
The work *A* is placed manually in a hole in the fixture body *B* and forced against the milling cutter by means of the handle *C* while the forked ejector *F* is retained in its inward position by the springs *D*. The slide to which the ejector is attached is mounted on top of the block at a slight angle in order to engage a hook *E* that is attached to the operating handle *C* and is free to pivot on it.

As the handle is swung to the right for the milling operation, hook *E*, which is held by a spring against a bottom stop, engages the projection or hook on ejector *F*. When the milling operation is completed, the handle is swung to the left, carrying the ejector and top slide with it, as indicated, and the ejector fork throws the work clear of the fixture into a chute. The hooks automatically disengage when the work is ejected, and the top slide returns to its initial position.



Fixture with automatic ejector for milling a slot in small brass rods

Welding of Railroad Cars Simplified

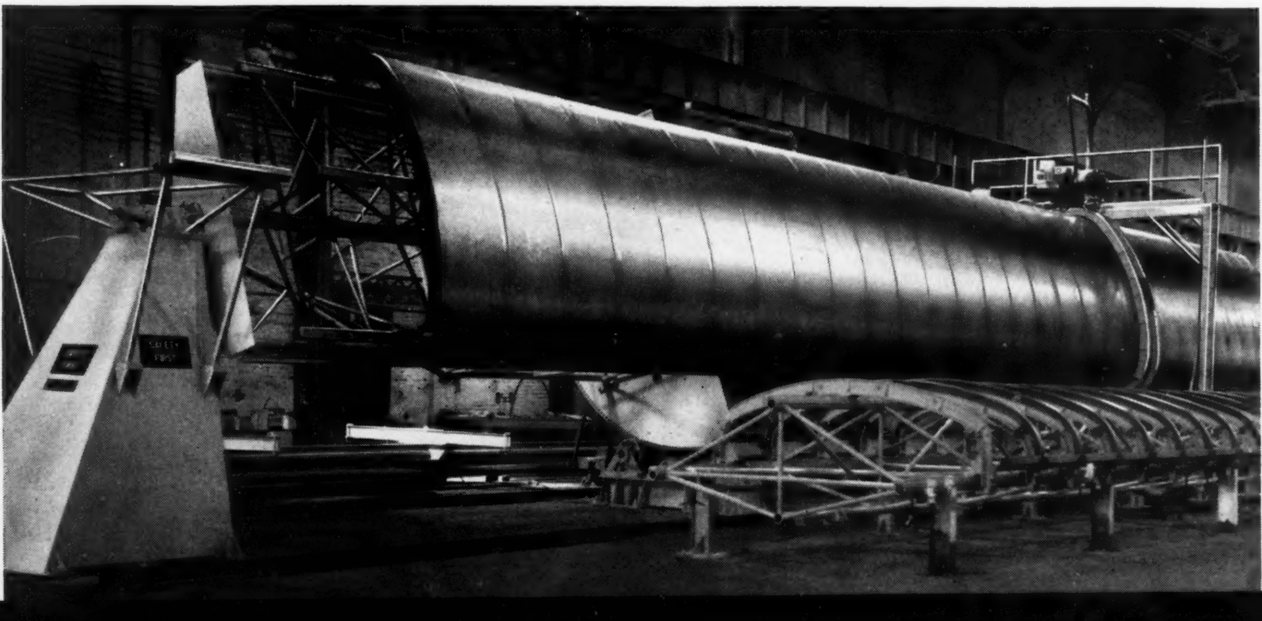


THE urgent need for passenger, freight, and hopper cars and the growing tendency to specify water-tight and weatherproof joints on these types of cars have necessitated application of the welding process in fabricating much present-day railroad rolling stock. This has presented certain shop problems because the large size of railroad car sections makes them awkward to handle.

In an effort to insure that welded joints on railroad cars will be sound and of the required strength, the Berwick plant of the American Car and Foundry Co. has installed several of the largest welding positioners in existence. One of these positions and rotates the roof of passenger coaches and diners, so that the various sections can be joined by an automatic shielded-arc welding head. Other positioners are designed to rotate entire hopper or freight cars so that the various sections can be joined in a "down-hand" position.

The roof sections for passenger cars are made of low-alloy, high tensile strength steel sheet of from 16 to 18 gage, depending on the road for which a car is intended. These sheets, about 30 inches wide, are joined to hat-shaped rafters called carlines, which, when the roof is finished, are riveted to the sides of the car.

Fig. 1. The welding positioner here illustrated is capable of handling the entire roof section of a railroad passenger car



by Use of Huge Positioners

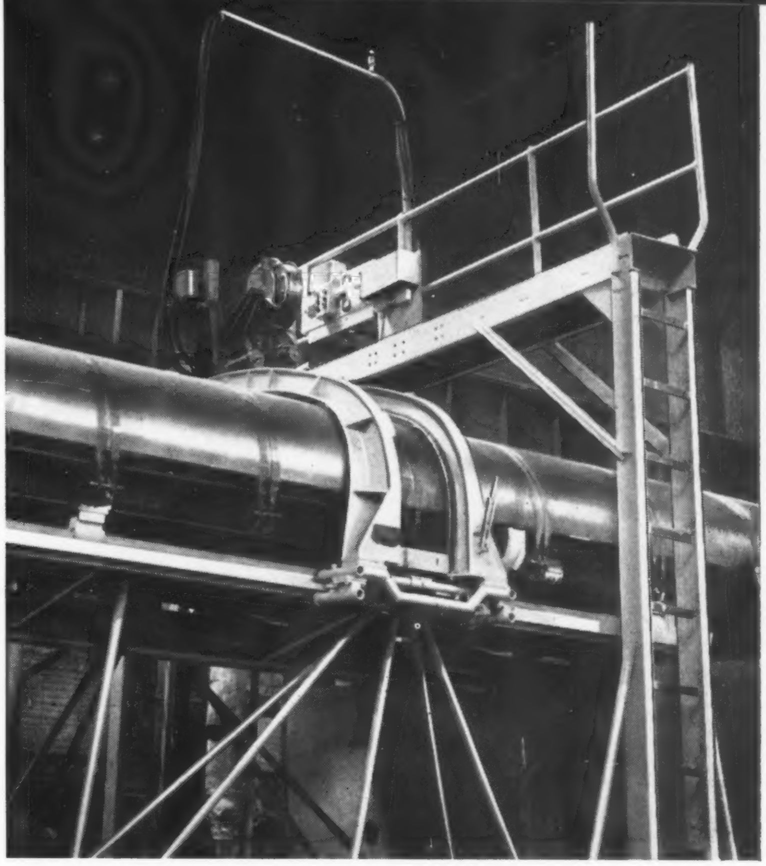


Fig. 2. The submerged arc welding head travels across the car roof on chains attached to rails that straddle the joint

Welding Positioners at the Berwick, Pa., Plant of the American Car and Foundry Co. Permit the Application of Automatic Welding to Railroad Passenger Car Sections and Enable All Welds on Freight and Hopper Cars to be Made in a "Down-Hand" Position

By JOHN W. SHEFFER
General Improvement Engineer
American Car and Foundry Co.

In the past, the steel strips were butted over the carlines in a jig such as shown at the right in Fig. 1, and tack-welded in place. After all the strips were positioned, the roof section was removed from the jig, and each individual strip joined to the adjacent sheet by manual arc-welding. This operation merely sealed the roof against the elements, the main structural welds being spot welds. While such a welding procedure resulted in a strong, good quality car, it required a considerable amount of time and the final product had a definite convolution or "draw in" between the sheets.

With the equipment shown in Fig. 1, these conditions do not exist. The carlines and strips are positioned in a modified jig and fastened to side beams either by means of a bolt or a tack weld. Hold-down strips, which can be seen in Fig. 2, are then placed on either side of the joint and tightened by means of power wrenches, after which the entire assembly is picked up by a spandrel and overhead crane and placed on the welding positioner. A weld that joins the two strips to each other and to the carline is made automatically by a submerged arc welding head mounted on rails running parallel to the

Fig. 3. Tubular members similar to those employed in aircraft construction are welded together to make this positioner

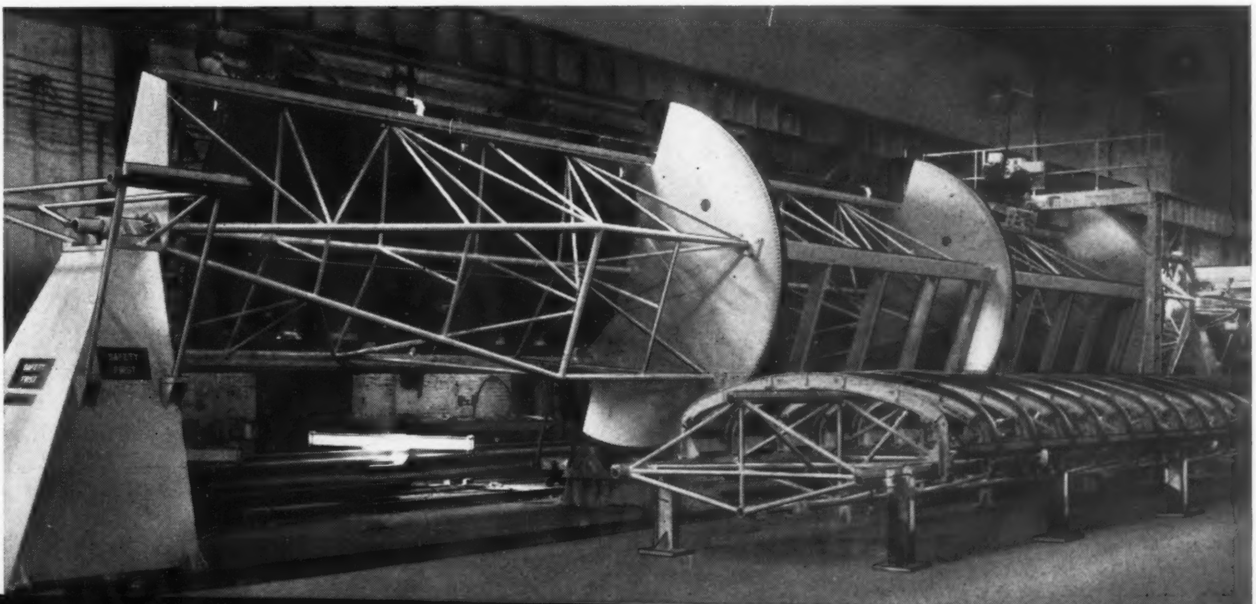


Fig. 4. Three positioners are used to turn hopper cars so that "down-hand" welds can be made on the bottom and two sides. The time required for welding in each position is only fifteen minutes

joint. The control station for the welder is located on a gantry that spans the positioner and runs on rails on the floor.

The gantry is moved along the positioner until the cross-rails on which the welding head rides straddle the first joint. At this point, the positioner is rotated until the edge of the roof is under the welding head, and the arc is then struck. As the positioner rotates, the welder moves over the cross-rails on a flexible chain attached to the track.

As the positioner rotates at a constant speed, it is necessary to control the speed of the welding head so that, as it moves across the curved top of the roof section, the weld will be made at constant speed. In addition, if movement of the head and the rotational speed of the positioner were not correlated, the welding rod would not remain perpendicular with respect to the joint, and the weld would not be uniform. Consequently, an electronic motor control that varies the speed of the welding head to keep the relative speed between the work and the welder constant has been added as accessory equipment.

A signal, the intensity of which depends on the speed at which the sprocket of the welding head travels on the flexible chain, is amplified and transmitted to the electronic control, which, in turn, either slows down or speeds up the driving motor on the head, as required. A constant distance between the welding arc and the work is maintained by a conventional automatic control governed by the impedence of the arc. The weld is made at speeds of 80 to 100 inches per minute; total cross-head travel is about 11 feet.

After the first joint has been welded, the gantry is moved to the next seam—a distance of approximately 2 1/2 feet—the positioner is started, and the cycle is repeated. Since the head can operate in either direction, it is not necessary to rotate the positioner back to its

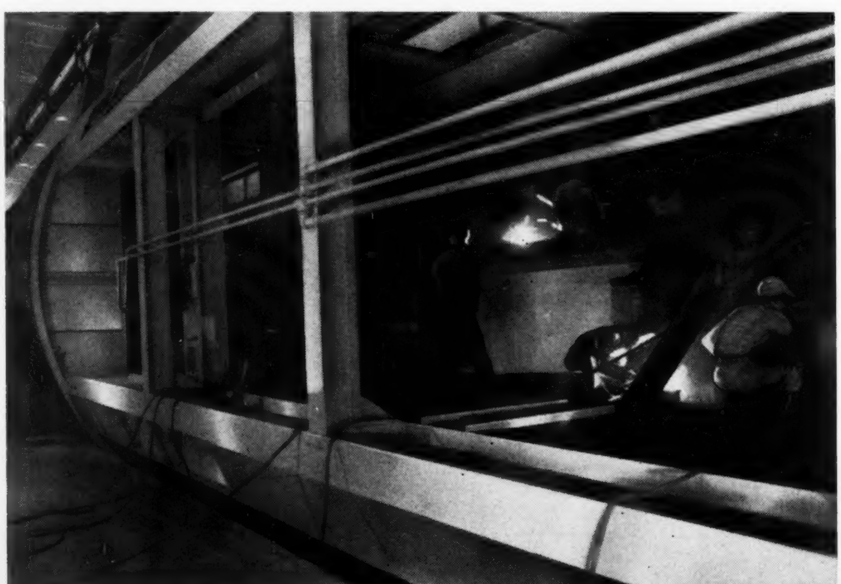
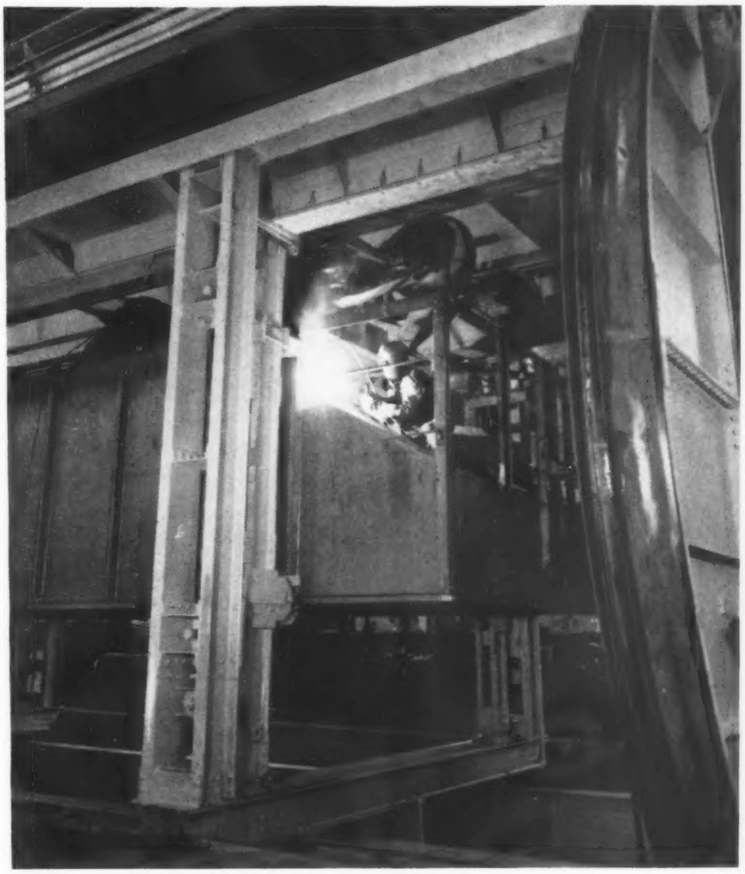


Fig. 5. In the first positioner, the car is turned on its side. Temporary inside braces are placed between the sides prior to rotation

Fig. 6. Screw-operated clamps driven from a common shaft square up the car in a positioner. The structural members that house the clamping drives are shown at the side and top of the car, which has been rotated 180 degrees from position shown in Fig. 5 for welding the bottom



original starting point. With the roof tilted on edge, the gantry is moved forward and the weld started on the same side of the roof section as in the previous operation.

This positioner can accommodate a roof 85 feet long. It is over 100 feet in length, and is built up from tubular members and I-beams, as shown in Fig. 3, in much the same way as the structural sections of an airplane. The three wheels, approximately 16 feet in diameter, that rotate the positioner are driven by pinions from a common drive-shaft. Little load is carried by the pinions, since the weight of the sprocket and positioner is taken by two thrust wheels mounted beside each. The construction of the wheels that rotate the positioner is somewhat unusual. They are made of two plates, separated by suitable spacers and bolted and welded together. The sprocket portion of the wheel is made by inserting shouldered studs between the plates and tightening them with nuts.

When a roof has been completed with this equipment, there is no "pull in" or distortion between strips. Also, the roof is stronger, because each strip is welded to an adjoining one and to the carline on which it is abutted. Thus, not only has production been increased, but the quality of the car has been improved.

Other positioners are used to turn entire hopper cars and freight cars to permit "down-hand" welding of all joints. Hopper cars, for example, are made in eight sub-assemblies, which include the sides, ends, under frame, hopper chutes, and floor sheets. These assemblies are brought together and tack-welded in place on the under carriage. The car is then rolled into the first positioner in the line, shown in Fig. 4, where it is turned 90 degrees for welding the joints on the side. In the next positioner, the car is turned 90 degrees in the opposite direction for welding the other side. Finally, in the third positioner, the car is turned upside down and the under side is welded. Suitable braces are placed between the sides before the car is rotated.

These positioners are approximately 55 feet long, and the wheels that rotate the positioners are 24 feet in diameter. The car is secured by four power clamps on each side, two at each end of the car, as shown in Fig. 6. The clamps at each end are operated from a common shaft which is connected to the screw-driven clamps through a series of bevel gears. This arrangement insures that the car is squared up before being welded, since each clamp is squared with the others and is moved an equal distance by the common drive. There is no distortion of the car, and any tilting is corrected by the clamps before the welds are made.

The positioners are part of a direct assembly line. The time that a car remains in each unit is fifteen minutes, making the total time for welding one car forty-five minutes.

While this equipment may seem large and expensive, especially since it only positions the car for "down-hand" welding, the benefits that result are many. As every manufacturing engineer knows, "down-hand" welding is much easier to perform than overhead or vertical welding, and thus the quality of the welds is better. This is an important factor, for in addition to strength, the joints in hopper cars must be weather-tight to eliminate leakage and to minimize corrosion; coal cars, particularly, are subject to corrosion from water and sulphur. Then, too, some hopper doors must be air-tight to prevent leakage of water and coal dust and to retain fine particles such as cement.

While the cars are in the positioners, inspectors check the quality of the weld and other workmanship. Thus the inspection is carried on simultaneously with the welding operation.

Tool Engineers Hold Annual Meeting

TECHNICAL papers of unusual interest marked the seventeenth annual meeting of the American Society of Tool Engineers, which was held at the Hotel William Penn, Pittsburgh, Pa., March 10 to 12, inclusive. Papers read at the Thursday evening session were as follows: "Design of Dies for Upsetting Forging Machines," by William W. Criley, vice-president and general manager, Ajax Mfg. Co.; "Industrial Applications of Glass," by Arthur G. Crowell, tool engineer, Kerotest Mfg. Co., and J. Wesley Richards, industrial designer, Koppers Co.; and "Color as a Tool," by Nelson A. Mason, manager, Maintenance-Painter Sales, Pittsburgh Plate Glass Co.

Friday evening the following papers were presented: "Processing Corrosion-Resistant Steel," by Forest F. Versaw, shop superintendent, Gulf Research & Development Co. Laboratories; "Problems in Forming Corrosion-Resistant Steel," by George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Co.; and "Techniques for Machining Corrosion-Resistant Steel," by Malcolm F. Judkins, chief engineer, Carbide Division, Firth-Sterling Steel & Carbide Corporation.

The technical sessions on Saturday were held in the morning, at which time the following papers were read: "Basic Facts Concerning Metal Spraying," by Walter B. Meyer, secretary, American Metallizing Contractors Association, and manager, Metallizing Division, John Nooter Boiler Works Co.; "Fabricating Aluminum," by Gardner Young, tool supervisor, Westinghouse Electric Corporation; "Drawing and Spinning Aluminum and Its Alloys," by E. G. Kort, Aluminum Co. of America; and "Efficient Machining of Aluminum Alloys," by E. S. Howarth, chief, Metal Working Division, Aluminum Research Laboratories, Aluminum Co. of America.

At the annual dinner, the following national officers were installed for the ensuing year: President, R. B. Douglas, president of Godscroft Industries, Ltd., Montreal, Canada; first vice-president, Herbert L. Tigges, executive vice-president of Baker Bros., Inc.; second vice-president, J. J. Demuth, Slyco Corporation; and third vice-president, Halsey Owen, Professor of Engineering, Purdue University.

The speaker at the dinner was Latham E. Osborne, senior operating vice-president of the Westinghouse Electric Corporation. His address was entitled "Tools—Key to Abundance."

Accurate Form-Grinding of Internal Surfaces

(*Continued from Page 148*)

inch, depending upon the amount of stock to be removed, the rigidity of the spindle, and the finish required. In roughing, when a small amount of grinding stock is left for finishing, an in-feed of 0.003 to 0.004 inch is used until, by inspection, it is found that only 0.001 inch or so of stock is left. Then the feed is reduced to 0.0003 inch, and finally finishing passes are made with an in-feed of 0.0001 to 0.0002 inch.

A typical example of internal form-grinding in the plant mentioned is illustrated in Fig. 5, where a cold-heading die is shown in various stages of completion. A gun type form drill was used to produce the internal form roughly in a lathe operation, as indicated at the top of the illustration. About 0.010 inch of stock was left on the diameter for form-grinding. The long central bore was reamed, leaving 0.005 inch of stock on the diameter for honing and lapping. These finishing operations were more practical for the bore of this die than internal grinding because of the length of the part.

A mounted wheel was dressed for rough-grinding the first step of the form, as shown at *A*. This wheel and others dressed in the same way were used for rough-grinding the first step in all the dies in the lot. After the first bore was rough-ground in a die, the work was turned around and the same form was ground in the other end. Then this die was removed and the procedure repeated for the other dies.

The other forms on the die were ground in the same way by using wheels such as shown at *B*, *C*, *D*, and *E* until all the dies were completely rough-ground. At the end of the rough-grinding, from 0.002 to 0.003 inch of stock was left on the diameters for finish-grinding. The same procedure was followed in finish-grinding, using the same wheels as in rough-grinding. Wheel in-feeds of 0.0002 to 0.0003 inch were employed for finish-grinding. A large saving in wheels and in dressing time resulted from the use of the same wheels for both rough- and finish-grinding operations.

Preparing Surfaces for Metallizing by Blast Cleaning

By RICK MANSELL

THE quickest and generally the most satisfactory method of preparing large surfaces for metallizing is by blasting them with either steel grit or sand. This procedure results in a rough, clean exterior to which the sprayed metal will anchor and bond.

There are some surfaces that in the original condition are sufficiently porous to receive a sprayed metal coating without any preparation; however, there are many more surfaces to which a sprayed coating of metal will not readily adhere unless they are first roughened and cleaned. Such a roughened surface is full of minute fissures and crevices into which the molten particles can lock themselves as the coating is applied. In addition, if the roughened surface is obtained by a blasting method, it will be free from dirt, moisture, oxides, and other surface impurities, all of which tend to diminish the adhesion of the metal coating.

Selection of the Blasting Abrasive

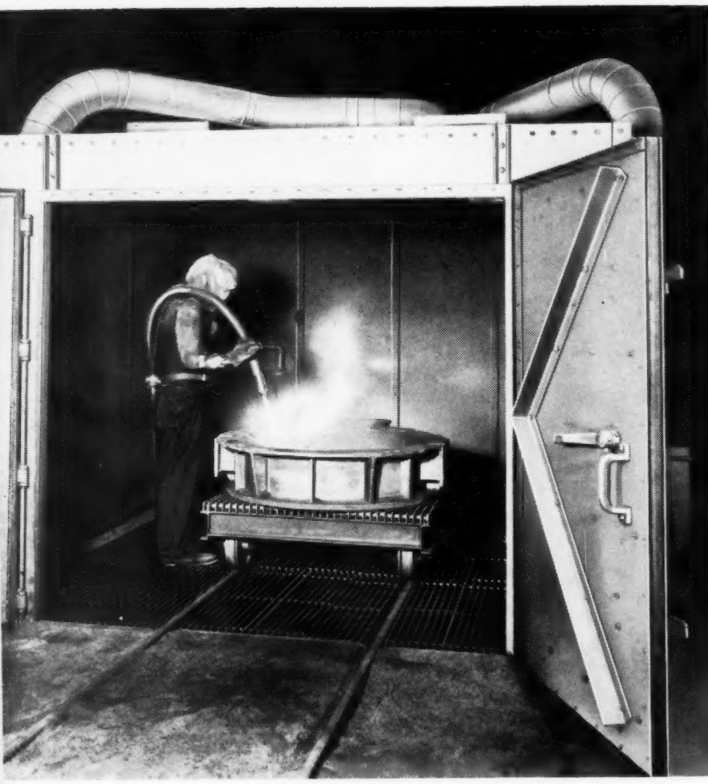
The equipment required for the blasting operation includes a high-pressure blast machine, a source of high-pressure air, and the right type of abrasive. For those conditions where the blast material cannot be recovered, sand is recommended. Its grains should be hard and angular to facilitate the cleaning action. Either silica, flint, or garnet sand meets these requirements. Round (beach) sand should not be used. The ordinary variety of blasting sand such as is employed for commercial sand-blasting and for cleaning purposes breaks up too rapidly and does not produce a surface that is adequately roughened.

The degree of surface roughness obtained depends on the size and sharpness of the grains of sand. For most jobs, a 16- to 20-mesh sand cuts well and the grain volume is sufficient to permit the blasting procedure to be quickly performed. While sand of a smaller mesh cleans faster, the grains are too small to produce the desired surface roughness. There are certain conditions in which a finer grade of sand may be used, but sands that are coarser than 16 mesh are not usually recommended. Sand may be recovered and used again if it is screened and the fine sand and dust removed prior to reusing.

In the majority of cases, angular steel grit is much more desirable for blast cleaning prior to metallizing. It cuts better than sand because of its hardness, and does not disintegrate. By actual test, it has been determined that steel grit has a life approximately sixty times greater than that of sand. It is recommended for all work where the blast material can be recovered, and is particularly useful for machine parts that cannot be prepared by the usual under-cutting methods.

The loss of steel grit is about 10 per cent per month when there are good reclaiming and handling facilities available. On the other hand, the loss of a sand abrasive may be about 25 per cent each day due to disintegration. Apart from its economy, steel grit creates practically no dust during the blasting operation, and hence requires less ventilation in the blasting room. Its first cost is higher than sand, but this is compensated for by longer life and other advantages.

Steel grit should be cleaned at regular intervals to remove the dust and foreign materials that accumulate from the work being blasted. If the equipment does not include an automatic grit elevator and cleaner, the abrasive should be run through a small hand cleaner whenever it becomes dusty.



Blasting a steel crusher casting with No. 30 steel grit. For this job, the air pressure is maintained at 100 pounds per square inch, and the air flow with a 3/8-inch tungsten-carbide nozzle is 232 cubic feet per minute

Although angular grit can be obtained in a wide range of sizes, only a few sizes are useful for surface preparation prior to the application of sprayed coatings. The larger grit particles produce a better roughening effect, but take a longer time than the smaller particles. For this reason, it is desirable to select the smallest grit particles that will give the proper bonding for a particular job. It should be noted that the larger the grit number, the smaller is the particle size of the abrasive.

With the average types of work that are metallized, a mixture of equal parts of grades Nos. 30 and 40 steel grit will be satisfactory. This mixture will combine the cutting action of the No. 30 grit with the speed of the No. 40.

In the case of cylindrical machine elements where the base material is unusually hard, best results are obtained by using No. 20 or No. 15 grit. This applies to such parts as crankshafts, lathe beds, cylinder liners, and hardened pieces. No. 30 grit is used for machine elements such as rolls, shafts, and parts having press fits. It is also used for preparing tanks to be coated with such metals as nickel, stainless steel, bronze, copper, and Monel metal.

For preparing surfaces to be coated with tin, lead, zinc, aluminum, or cadmium in thicknesses greater than 0.015 inch, No. 40 grit is used. However, when the thickness is to be less than 0.015 inch, No. 50 is used. In the case of light, fragile pieces with thin sections or pieces that might be easily distorted by the blasting process, a fine grit, such as grade No. 60, should be used. This size is not recommended for any other work.

A new abrasive known as "Metcolite" has recently been developed by the Metallizing Engineering Co., Long Island City, N. Y. This material is non-metallic, very hard, and does not rust. It breaks up along its cleavage planes, and hence maintains a sharp cutting edge. On account of its exceptionally light weight, it can be used with very low air pressures and hence, is ideal for blasting light-gage stock without danger of warping or distortion. When used in pressure machines having a 10-foot length of hose, a pressure of 35 pounds per square inch is maintained. Each additional 10 feet of hose calls for an increase of 10 pounds per square inch in air pressure. When used in suction machines, a 75-pound pressure is recommended.

Air Volume and Pressure Required

Besides use of the proper abrasive, it is necessary that the air supply be ample, in volume as well as in pressure. It is also essential that the air be free from moisture and oily vapors. The

Air and Material Flow for Various Blast-Nozzle Orifices*

Nozzle Diameter, Inches	Air Flow, Cubic Feet per Minute							Recommended Hose Size, Inches	Approximate Flow per Hour, Pounds	
	40 P.S.I. Gage Pressure	50 P.S.I. Gage Pressure	60 P.S.I. Gage Pressure	70 P.S.I. Gage Pressure	80 P.S.I. Gage Pressure	90 P.S.I. Gage Pressure	100 P.S.I. Gage Pressure		Sand	Steel Grit
3/16	27.50	32.80	37.50	43.00	47.50	52.50	57.88	3/4 or 1	500	1250
1/4	49.10	58.20	67.00	76.00	85.00	94.00	103.00	1 or 1 1/4	900	2250
5/16	76.70	90.70	105.00	119.00	133.00	146.00	161.00	1 1/4 or 1 1/2	1200	3250
3/8	110.00	130.00	151.00	171.00	191.00	211.00	232.00	1 1/4 or 1 1/2	1700	4250
7/16	150.00	178.00	206.00	233.00	260.00	286.00	315.00	1 1/2 or 1 3/4	2200	5500

*Compiled by the Metallizing Engineering Co., Inc.

existence of dampness causes sand to cake up and steel grit to rust, and the presence of oil causes the base metal to be covered with a greasy film that prevents the coating metal from adhering properly.

For all blasting operations on metallic surfaces, air pressures of 80 to 100 pounds per square inch are recommended. Sometimes greater pressures are used if these are available, always taking care to avoid the danger of warping the base material. The air pressures are also regulated according to the ability of the abrasive to withstand impact.

The volume of air needed for blasting depends upon the size of the orifice of the blast nozzle, as shown in the accompanying table. With a nozzle opening of 1/8 inch, 17 cubic feet of air per minute is required to obtain a pressure of 60 pounds per square inch. The same nozzle requires 26 cubic feet of air to produce a pressure of 100 pounds per square inch. In the case of a 5/16-inch nozzle, a 60-pound pressure requires 105 cubic feet of air per minute, while a 100-pound pressure takes 161 cubic feet of air per minute.

When the size of the compressor and the volume of air it will deliver are known, the size of nozzle to be used for the job can be determined. Naturally, the largest possible nozzle should be selected. As a general rule, a 1/4-inch nozzle is efficient and will handle any of the recommended abrasives. This size nozzle will handle 67 cubic feet of air under a pressure of 60 pounds per square inch, 85 cubic feet under a pressure of 80 pounds per square inch, and 103 cubic feet under a pressure of 100 pounds per square inch.

No set rules can be given for the proper air pressures to use in the blasting operation, as these vary from 30 to 100 pounds per square inch. The speed of travel through the pipes or hose is practically the same for all abrasives of equal weight at all pressures above 10 pounds. The volume is governed by the discharge opening. A 1/4-inch nozzle will handle 900 pounds of sand per hour, compared with 2250 pounds of angular steel grit. A 5/16-inch nozzle will handle 1200 pounds of sand per hour, compared with 3250 pounds of steel grit.

Ferrous castings and steel plate require an air pressure of at least 80 pounds per square inch. In the case of aluminum, a pressure of 60 pounds is ample, and a lighter abrasive is used. When blasting galvanized surfaces, the pressure must be greatly reduced and a fine abrasive employed. This precaution is essential because the use of heavy blasting loosens the galvanized surface from the iron and causes it to blister.

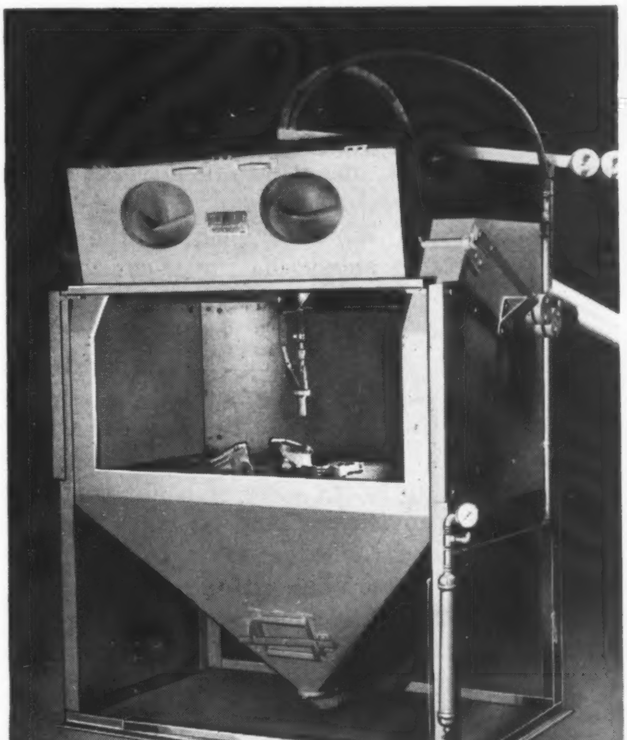
There is danger of warping and buckling if large areas of light-weight sheet metal are blasted with coarse grit and with high air pressures. Even flat plates as heavy as 1/4 inch thick often buckle, but if these are turned over and blasted on the reverse side, they generally flatten out.

Removing Surface Oil and Grease from Part to be Metallized

Surfaces that have been in contact with oil or grease over a long period of time must be degreased before being blasted; otherwise, oil and grease will collect on the steel grit and render it unsuitable for further use. While the surface structure of rolled or drawn metals is such that they rarely absorb oil, castings of iron and steel are susceptible to the penetration of oil through porous spots and defects.

There are various methods of removing the oil or grease. If the parts are small, a regular degreaser can be used. Another method is to heat them in a furnace or by a torch, so that the oil is driven to the surface and burned off. Or, if desirable, a chemical cleaner may be used.

Occasionally the existence of oily areas is not noticed until after the surface has been blasted.



A suction type blast cabinet for preparing castings for metallizing. Such equipment is widely used for sand-blasting operations on relatively small work

Their presence is indicated by patches which are darker than the rest of the surface. As a general rule, blasting automatically performs all the cleaning that is necessary. However, those surfaces that clearly indicate the presence of oil must be cleaned before any attempt is made to metallize them.

Suggestions on Blasting Technique

For surfaces that are hard to work with, it is recommended that the nozzle be held about 8 to 12 inches away from the work. In the case of softer materials, the nozzle is held farther away from the surface and the air pressure is reduced. No more of the surface should be blasted than can be metallized in a single day because an oxide film tends to form on a freshly blasted surface, particularly in humid and corrosive atmospheres. In cases where this precaution cannot be observed, as, for example, in blasting large tanks and similar parts, the surfaces should be thoroughly blasted and lightly reblasted just before metallizing. When the surface has an extremely heavy coating of paint or scale, it is advisable to first blast the surface with cheap cleaning sand and then reblast with steel grit.

When heavy coatings are applied over comparatively large areas of the type found on turbine runners and pump impellers, it is necessary that additional support be given to anchor the sprayed metal. For example, flat-head screws can be inserted in the face of the area in such a way that the sprayed metal locks itself around these screw-heads and receives additional anchorage. Wherever possible, the edges of the depression should be under-cut around the extreme outer edge of the surface to be coated and the screw-heads should preferably be composed of the same metal as is used for the sprayed coating.

Another precaution should be observed when it is necessary to bring a heavy coating of sprayed metal up to the edge of a flat surface. In this case, provision should be made to key the coating along the edge so as to minimize any danger of the coating lifting when it cools. This is best effected by notching or slotting the base surface along the edge before the coating is applied. A hacksaw blade should be used for this purpose. The slots should be about 1/16 inch deep at the edge and taper back about 1/2 inch; they are spaced from 1/4 to 1 inch apart, depending on the thickness of the coating to be applied. After this initial preparation, the slots, as well as their edges, are thoroughly blasted, along with the rest of the surface.

On flat surfaces, it is preferable not to build up too high a thickness of metal. More than 0.018 inch of aluminum or 0.020 inch of tin, zinc, or steel should be avoided. In the case of lead coatings, thicknesses up to 0.040 inch have been built up without the necessity of reinforcement. When a greater thickness is desirable, an additional anchorage is often furnished either by spot-welding, drilling, tapping, or other means. These limiting thicknesses apply only to large flat surfaces; on surfaces of the usual machine elements, coatings up to 3/8 inch have been applied.

[The illustrations in this article were supplied through the courtesy of the Ruemelin Mfg. Co., Milwaukee, Wis.—EDITOR]

* * *

George Gorton Machine Co. Receives National Labor Relations Award

The distinction of being selected for the 1948 award of the Labor Relations Institute of New York for "outstanding achievement in industrial relations" was recently conferred upon the George Gorton Machine Co. of Racine, Wis., manufacturer of machine tools. This award is the first of its kind to be given to any company. The award, in the form of a bronze plaque, was presented to George Gorton III, executive vice-president and general manager of the company, and to Carl Wohlin, chairman of the Union Committee, by Ola C. Cool, director of the Labor Relations Institute, at a ceremony in the Gorton plant.

The George Gorton Machine Co. was chosen for this award from among thousands of manufacturers located in every state in the Union. The master of ceremonies was Larry Sorensen, president of the Belle City Chapter of the International Association of Machinists, who stated that he, as a Gorton employe, as well as a union official, believed that this event symbolized the highest type of cooperation between management and union members.

An informal dinner followed the presentation ceremonies, which was attended by representatives of education, management, labor, and various civic organizations. All the foremen of the company were present, as were members of last year's and this year's Union Committees. In one of the talks made at the dinner, William D. Stansil, executive secretary of the Racine Manufacturers' Association, paid special tribute to Carl Lockrem for his contribution to the fine industrial relations record of the company in his capacity as director of industrial relations.

Beryllium Copper as a Spring Material

By JOHN T. RICHARDS, Design Engineer
The Beryllium Corporation, Reading, Pa.

The High Strength, Hardness, and Electrical Conductivity of Beryllium Copper (Obtainable through Heat-Treatment) Combined with Good Ductility and Formability in the Heat-Treatable Condition, Offer the Designer of Springs an Unusual Combination of Properties

THERE is obviously a place in the field of spring design for a material that provides good conductivity and resistance to corrosion, combined with the high mechanical properties required in many modern applications. Beryllium copper is such a material, presenting an outstanding compromise between steel and copper. It has the corrosion resistance of copper and practically the same conductivity, with a strength approaching that of spring steel. The combination of high elastic and fatigue strength, hardness, electrical and thermal conductivity, and resistance to wear and corrosion has established its usefulness where such properties are necessary for current-carrying springs, instrument springs, and a variety of other spring components.

The beryllium-copper alloy generally used in spring applications has the following nominal composition: Beryllium, 2 per cent; cobalt or nickel, 0.3 per cent; and the remainder copper.

Springs of beryllium copper are readily formed in the annealed or in the annealed and cold-worked condition, after which they are given a simple low-temperature heat-treatment that doubles the strength of the alloy. This is in contrast to spring materials deriving all their strength from cold work, such as brass or bronze, which invariably have low formability in the most desirable tempers. The disadvantage of using a material at less than peak strength is that the maximum possible deflection without permanent set is reduced. Thus, in the case of phosphor-bronze, an increase in elongation from 2 to 10 per cent to increase formability reduces the elastic limit by about 30 per cent. Properties of heat-treatable and heat-treated beryllium copper are given in Table 1.

The heat-treatment of beryllium copper requires from two to three hours at 600 degrees F., and is no more difficult than many of the hardening operations regularly carried out on steel. Since the rate of cooling from the hardening temperature is not critical, springs can be quenched in water or cooled in air without affecting their properties in any way. Curves showing the effect of cold-working and heat-treatment upon the strength of beryllium copper are shown in Fig. 1. It is apparent from these curves that the best properties result from using the highest temper that can be formed.

In normal operation, springs undergo flexures that often render impractical the use of protective coatings to combat corrosion. In addition, the cleaning operation used in connection with the plating of steel frequently causes hydrogen embrittlement, which may drastically reduce the life of the spring. Accordingly, there is a need for a high-strength spring material with inherent corrosion resistance.

Under normal conditions beryllium copper offers high resistance to the atmosphere, fresh and salt waters, most alkaline solutions, and some acids. It has poor resistance to certain compounds of ammonia, sulphur, and mercury, as well as to oxidizing acids. Increases in temperature usually accelerate corrosion, often to a rather high degree. Although stress corrosion or season cracking is apparent in some copper-base alloys, particularly high-zinc brasses, it has no effect upon beryllium copper.

Table 1. Properties of Heat-Treatable and Heat-Treated Beryllium Copper

Property	Heat-Treatable	Heat-Treated
Modulus of Elasticity, Pounds per Square Inch	17,000,000	19,000,000
Torsion Modulus, Pounds per Square Inch	6,500,000	7,300,000
Specific Gravity	8.21	8.26
Density, Pounds per Cubic Foot	0.296	0.298
Coefficient of Linear Expansion per Degree F. (68 to 392 Degrees F.)	0.0000095	0.0000095
Electrical Conductivify, Per Cent, (International Annealed Copper Standard)	15 to 20	23 to 30
Thermal Conductivity*	465 to 625	790 to 865

*B.T.U. per hour per degree temperature difference per square foot of area and for 1 inch thickness.

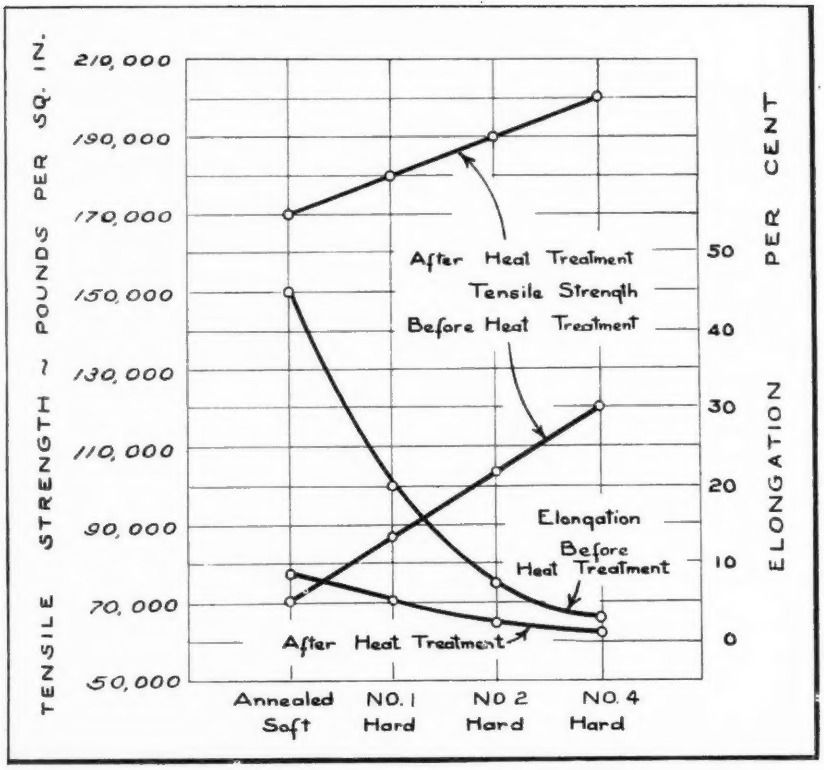


Fig. 1. Effect of cold-working and heat-treatment on the tensile strength and percentage of elongation of beryllium copper

Since fatigue stresses accelerate corrosive action, corrosion-fatigue is generally of greater importance in spring applications than direct chemical attack. Fig. 2 shows the relative endurance limits of several spring materials in air and in a salt spray, the unshaded areas representing air and the black areas salt spray. The materials tested were: *A*, 0.5 per cent carbon steel; *B*, 15 per cent chromium steel; *C*, 18 per cent chromium, 8 per cent nickel steel; *D*, beryllium copper; and *E*, phosphor-bronze. It will be noted that beryllium copper has a good service life in marine atmospheres. Endurance limits are based on 50,000,000 stress reversals.

The amount of electric current that can be conducted by a given cross-section of spring material is limited by the heat generated, which, in turn, depends upon the resistance offered by the conductor. Therefore, in current-carrying spring applications, beryllium copper offers space-saving opportunities because of its high strength-conductivity.

Any spring material may show inelastic behavior, which means that springs do not always follow the elastic laws exactly, but are subject to drift and hysteresis, depending upon the stress and temperature. In certain critical applications, allowance for these effects must be made in the design. Resistance to inelastic behavior depends upon a high elastic limit and freedom from internal stress. In cold-worked materials, sufficient heating to relieve internal stresses effectively will also reduce the elastic limit. On the other hand, in the case of beryllium copper, a hardening heat-treatment that doubles the elastic limit also relieves internal stresses. Therefore this alloy is finding increased use for instrument springs and other critical parts embodying spring principles.

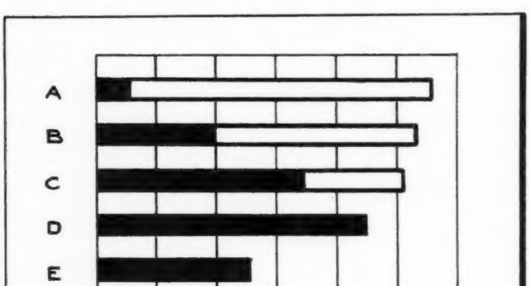
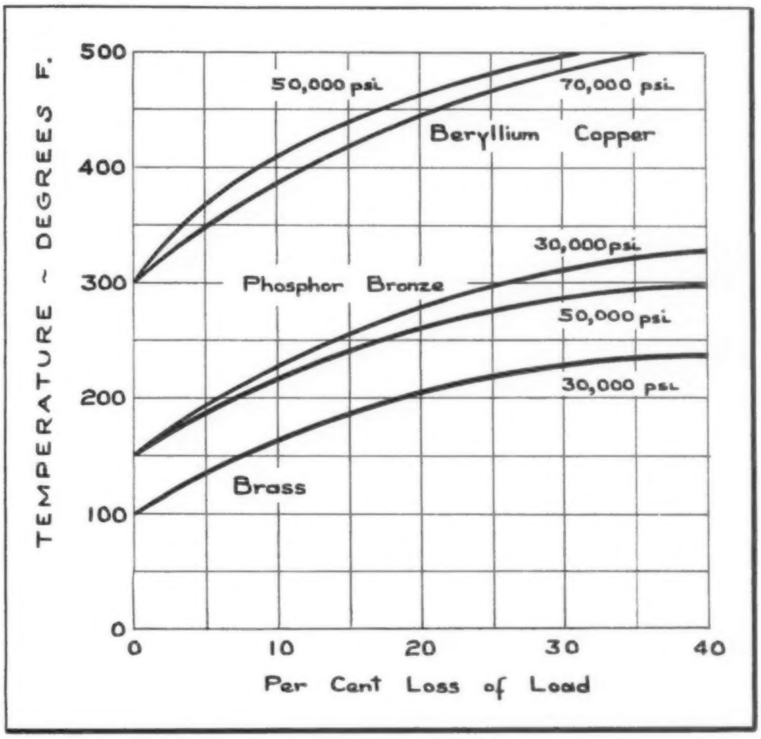


Fig. 2. Comparative endurance limits of different spring materials in air (unshaded areas) and in salt spray (black areas): (A), 0.5 per cent carbon steel; (B), 15 per cent chromium steel; (C), 18 per cent chromium, 8 per cent nickel steel; (D) beryllium copper; and (E), phosphor-bronze

Fig. 3. Loss of room-temperature elastic strength of beryllium copper, phosphor-bronze, and brass, for various temperatures and design stresses



Although most springs operate at or near room temperature, they are occasionally subjected to elevated temperatures. Heat-treatable alloys will over-age with prolonged exposure to temperatures in the hardening range. Accordingly, beryllium copper will soften at service temperatures above 550 degrees F. In actual practice, however, the following factors will generally limit operation to temperatures considerably below the hardening range: (1) Thermal expansion; (2) changes in modulus of elasticity with changes in temperature; (3) rapid increase in drift and hysteresis with increase in temperature; and (4) relaxation with increasing temperature.

Although thermal expansion causes changes in dimensions with changes in temperature, the effect is generally small and not of much importance in spring applications. The coefficient of expansion for beryllium copper is comparable to that found in other copper alloys, and generally needs to be considered only where a spring fits into a hole or where alignment is critical.

In calibrated or instrument springs, allowance must be made for the decrease in modulus of elasticity which occurs when temperature increases produce an increased deflection for a given load. With a decrease in temperature, however, the modulus of elasticity increases, giving a slightly stiffer spring. In beryllium copper, a 1 per cent change in modulus of elasticity takes place for each 60 degrees F. change in temperature.

Although the effects of drift and hysteresis at room temperature are generally too small to be considered, except for the most critical applications, they increase rapidly when service temperatures are higher than normal.

Relaxation may be defined as the loss of load or pressure of a spring with time, for a constant deflection. Because of the reduction in elastic strength with increased temperatures, a stress induced by a given spring deflection that is below the elastic limit at room temperature may be considerably above the elastic limit at an elevated temperature. Part of the elastic strain is thereby transformed into permanent strain. Consequently, the amount of recoverable strain is reduced, with a corresponding loss of load or pressure.

The loss of ultimate strength cannot serve as an indication of relaxation, since the elastic strength generally decreases more rapidly with increasing temperature than the ultimate strength does. Loss of room-temperature elastic strength of beryllium copper for various temperatures and design stresses, compared with loss of elastic strength of phosphor-bronze and brass, is shown in Fig. 3.

Joining operations such as soldering, welding, or brazing are readily performed on beryllium copper if reasonable care is exercised. It can be soft-soldered after heat-treatment, or silver-soldered or welded before heat-treatment, with little loss of final properties. These convenient methods of joining are not, of course, permissible with alloys depending upon cold-working for strength and hardness, since the tempera-

Table 2. Tensile Strength of Beryllium-Copper Wire

Condition of Wire	Tensile Strength, Pounds per Square Inch
Annealed*	58,000 to 78,000
Annealed and Heat-Treated	150,000 to 180,000
Cold-Drawn*	110,000 to 135,000
Cold-Drawn and Heat-Treated	180,000 to 220,000
Pre-tempered*	150,000 to 160,000

*Wire supplied in this condition has sufficient formability to withstand being bent cold through an angle of 120 degrees to a radius equal to the wire diameter without cracking.

tures involved are more than sufficient to anneal the material.

In using beryllium copper for springs in place of some other material, it is generally not advisable to make a direct substitution. To utilize fully the properties available in beryllium copper, the spring should be redesigned to allow for changes in modulus of elasticity, allowable stress, and conductivity.

The allowable working stress and the modulus of elasticity are limited by the material chosen for a particular spring design. Although the modulus of elasticity is generally considered a constant for a given metal or alloy, it increases in beryllium copper during heat-hardening, reaching a maximum beyond the time required for peak hardness. Because of this change, performance tests on springs must be made after hardening, since the increase in modulus of elasticity will change the stiffness or load-deflection rate of the part.

Safe design stresses depend not only on the material used, but also on the type of load (static or endurance), and the operating conditions. An important feature to bear in mind is that, during assembly, a spring may be subjected to higher stresses than normally occur in use or are allowed for in design, so that the maximum stress induced may exceed the elastic limit, with a resulting permanent set.

When a beryllium-copper helical spring is designed to replace one made of phosphor-bronze or brass, the wire diameter must be decreased to give the same deflection under similar load conditions. A decrease in wire diameter is permissible because a higher safe working stress can be used with beryllium copper. By decreasing the number of coils in proportion to the modulus of elasticity instead of changing the wire diameter, a phosphor-bronze or brass spring can be replaced with a shorter one of beryllium copper, thus effecting a saving in space and material.

In changing a coil spring from steel to beryllium copper, redesign is necessary to give the same deflection under the same load. The new design must allow for a smaller modulus of elasticity by increasing wire diameter, or decreasing mean coil diameter or number of active coils.

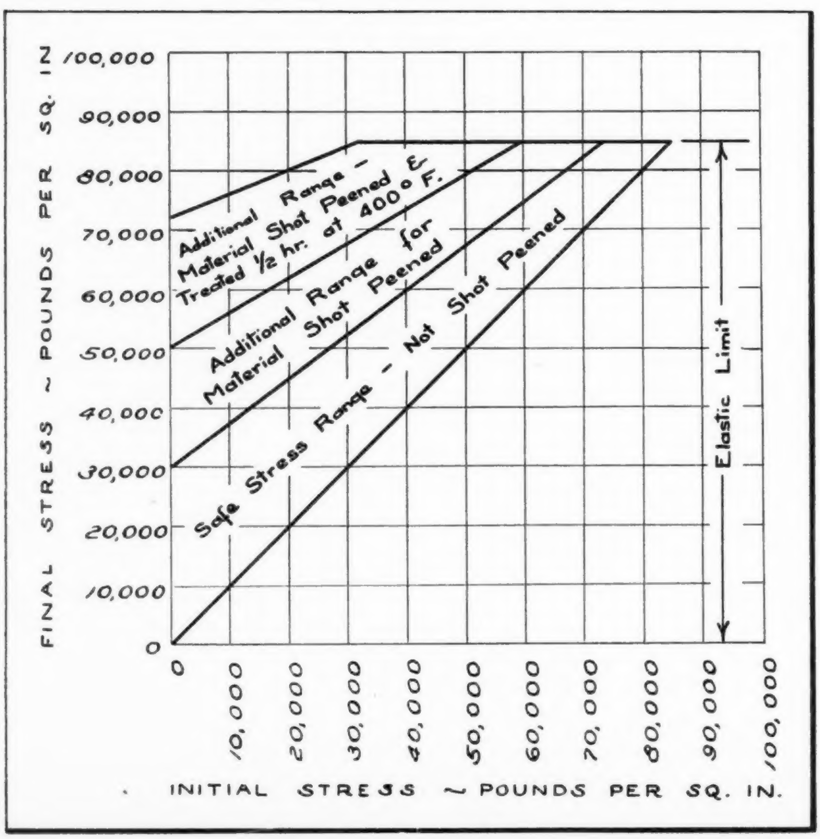


Fig. 4. Safe stress ranges for fully hardened, beryllium-copper helical springs, 0.148 inch in diameter, for compression applications up to 10,000,000 cycles

An increase in wire diameter or a decrease in mean coil diameter will reduce maximum fiber stress. A decrease in the number of turns will have no effect upon stress. It is therefore possible to replace a steel spring with a beryllium-copper spring of somewhat larger wire diameter and fewer coils, meeting the deflection requirements for a given load with a slightly lower working stress. For a practical substitution, the maximum stress must be within the safe range for beryllium copper.

The two types of beryllium-copper wire generally used in the production of helical springs are (1) heat-treatable and (2) homogenized and cold-drawn (pretempered). The former requires a hardening heat-treatment at temperatures ranging from 600 to 725 degrees F. following the coiling operation. Pretempered wire is handled similarly to other cold-drawn wire, and requires no hardening treatment after forming.

When it is desired to stress-relieve springs coiled from pretempered wire, they may be heated from fifteen to thirty minutes at 400 degrees F. This is not necessary with heat-treated springs, since they are stress-relieved during hardening. Some allowance should be made in the design for the final properties of pretempered wire, which are slightly lower than those obtained in heat-treated material. Typical tensile strengths of beryllium-copper wire for various conditions are shown in Table 2.

Safe design stresses depend upon the type of load to be applied. For loads that are relatively constant or applied infrequently, stresses up to 80,000 pounds per square inch may prove satisfactory. In the case of endurance loads, however, it is necessary to reduce the design stresses in order to prevent failure from fatigue.

Fig. 4 shows the safe ranges for fully hardened helical springs, coiled from heat-treatable 2 per cent beryllium-copper wire. These safe stresses are for cold-drawn and heat-treated

Table 4. Minimum Forming Radius for Beryllium-Copper Strip

For Heat-Treatable Material up to 0.040 Inck Thick

Temper	Ratio of Inside Radius of Bend to Stock Thickness		
	Bend Perpendicular to Direction of Rolling	Bend at 45 Deg. to Direction of Rolling	Bend Parallel to Direction of Rolling
Annealed	Sharp	Sharp	Sharp
No. 1 Hard	1.0	1.5	2.0
No. 2 Hard	2.0	2.5	3.0
No. 4 Hard	4.0	5.0	6.0

wire, 0.148 inch in diameter, and apply to compression springs with up to 10,000,000 cycles. This diagram is based in part on recent work by F. P. Zimmerli.

Where wire sizes permit, shot-peening will increase allowable design stresses approximately 100 per cent. For best results, the shot-peening operation should be followed by a thirty-minute stress-relieving treatment at 400 degrees F.

In the design of extension springs, it is not possible to obtain initial tension with heat-treatable beryllium-copper wire, since the hardening treatment relieves the internal stresses induced by back-winding. Pretempered wire, however, can be coiled with initial tension.

In general, when a brass or bronze flat spring is to be replaced with one made from beryllium copper, either the width or thickness of the spring, or both, must be decreased to give the same deflection under the same load conditions. This decrease in cross-section to compensate for an increase in modulus of elasticity will cause an increase in the maximum stress of the material. Since the allowable working stress of beryllium copper is higher than that of brass or bronze, such a dimensional decrease is not only permissible, but also saves material, space, and weight. Typical properties of beryllium-copper strip for

Table 3. Properties of Heat-Treated Beryllium-Copper Strip for Material up to 0.040 Inch Thick

Property	Temper			
	Annealed	No. 1 Hard	No. 2 Hard	No. 4 Hard
Ultimate Tensile Strength, Pounds per Square Inch	170,000	180,000	190,000	200,000
Elongation in 2 Inches, Per Cent	5 to 8	4 to 6	2 to 4	1 to 2
Proportional Limit (0.002 Per Cent Offset), Pounds per Square Inch	70,000	80,000	90,000	100,000
Elastic Limit (0.002 Per Cent Permanent Set), Pounds per Square Inch	75,000	85,000	95,000	105,000
Yield Strength (0.01 Per Cent Offset), Pounds per Square Inch	85,000	95,000	105,000	115,000
Yield Strength (0.2 Per Cent Offset), Pounds per Square Inch	140,000	150,000	160,000	170,000
Yield Strength (0.5 Per Cent Strain), Pounds per Square Inch	90,000	92,000	94,000	95,000
Modulus of Elasticity, Pounds per Square Inch	19,000,000	19,000,000	19,000,000	19,000,000
Rockwell Hardness, C Scale	33 to 41	35 to 42	37 to 43	39 to 44

heat-treated material up to 0.040 inch thick are shown in Table 3.

In replacing flat steel springs with ones made from beryllium copper, it is necessary to increase the width or thickness to allow for the difference in modulus of elasticity. This increase has the advantage of decreasing maximum fiber stress. With the same cross-section, a decrease in length of a beryllium-copper flat spring will give the same deflection, and stress will be reduced proportionately.

It is not necessary to consider grain direction in designing beryllium-copper flat springs, except in severely formed parts. The absence of pronounced grain direction of the material in the softer tempers gives almost equal strength and formability in all directions and permits the economical use of stock.

Table 4 indicates the minimum inside radius that can be formed in bending beryllium-copper strip of various tempers to a 90-degree angle in order to form complex shapes. In this table, relative formability is expressed as a ratio of the formed radius to the stock thickness, and is applicable for strip up to 0.040 inch thick.

As in the case of helical springs, design stresses depend upon the type of load applied. For static loads, the maximum allowable stress will be limited by the amount of offset or of permanent set permissible in the application. When no deviation from the elastic condition is allowable, working stresses must be kept below the proportional limit. When space permits, a maximum design stress of at least 10,000 pounds per square inch below the proportional limit is recommended to insure positive action in statically loaded flat springs.

In the case of flat springs subjected to endurance loads, design stresses must not exceed the fatigue limit. From Fig. 5, safe stress ranges for beryllium-copper flat springs that will withstand 10,000,000 flexures, or load-cycles, can be determined. These stress ranges apply to 2 per cent beryllium-copper strip, 0.032 inch thick, No. 4 hard, and heat-treated. For applications involving more than 10,000,000 flexures, the working stresses should be kept 10 per cent or more under the figures shown; while for a moderate number of cycles, such as 100,000, a stress value between static and endurance figures may be used, but with some caution.

These design stresses will be of help only where the spring is such that it can be readily subjected to stress analysis. Since the original flatness of stock is not generally preserved in fabrication, adequate allowance must be made for spring forms that introduce higher stresses than shown by a spring design formula. High localized stresses may be caused by bends, holes, uneven clamping surfaces, etc. In general, a spring design formula should be used only as a guide, to be supplemented by actual tests.

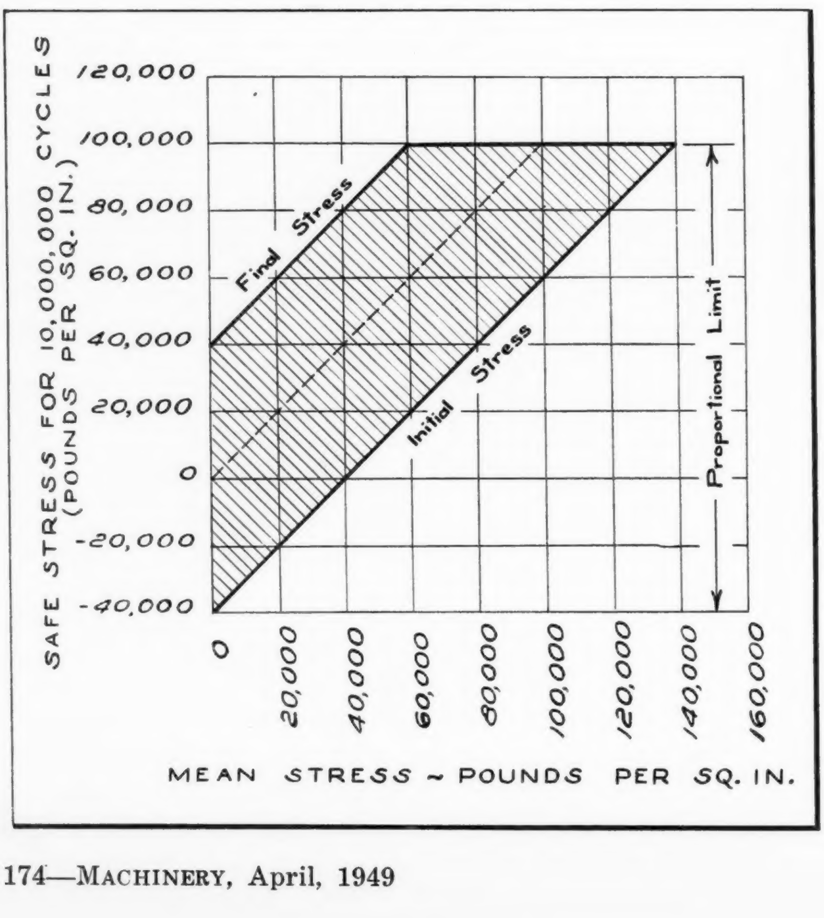


Fig. 5. Safe stress range for heat-treated beryllium-copper flat springs, 0.032 inch thick, subjected to 10,000,000 flexures

Crucible Steel Co. Completes Expansion of Cold-Rolling Plant

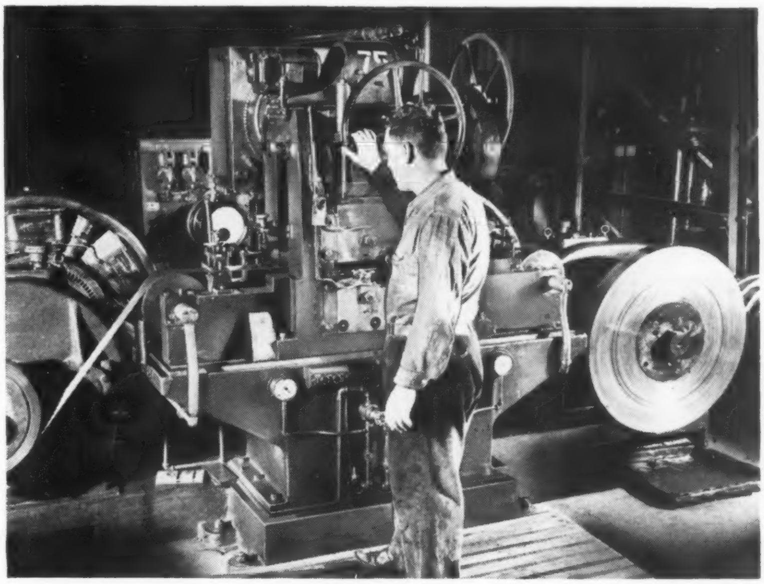


Fig. 1. Bennewitz high-speed reversing cold-rolling mill which reduces the thickness of cold-rolled spring steel, razor blade steel, etc., down to 0.004 inch. It operates at rolling speeds up to 1200 feet per minute

THE Crucible Steel Company of America has recently completed an improvement and expansion program at its Spaulding Works, Harrison, N. J., costing more than $3,200,000, as a result of which it is claimed that the plant is in a position to produce the world's widest range of cold-rolled alloys, stainless steel, and high-carbon steel specialties. Strip down to 0.004 inch thick can be produced, as well as various steel shapes, including squares, hexagons, triangles, flats, single bevels (of which the thin edge is later ground and polished to form the cutting edge of knives, for example), double bevels, and grooved strip. The plant has a production and materials-handling area of 275,000 square feet, and is arranged throughout for straight-line production.

Fifteen new cold-rolling mills have been installed. Automatically controlled annealing furnaces provide for annealing the steel before and during rolling in order to condition it for processing. Some of these furnaces are designed to shield the steel entirely from flames or air, so that it is annealed without the finish being affected in any way, even though the temperatures may be 1900 degrees F. or more. Bennewitz rolling mills, which are used extensively in this plant, can roll up to 1200 feet of steel strip per minute.

Some steel strip is heat-treated by a multiple

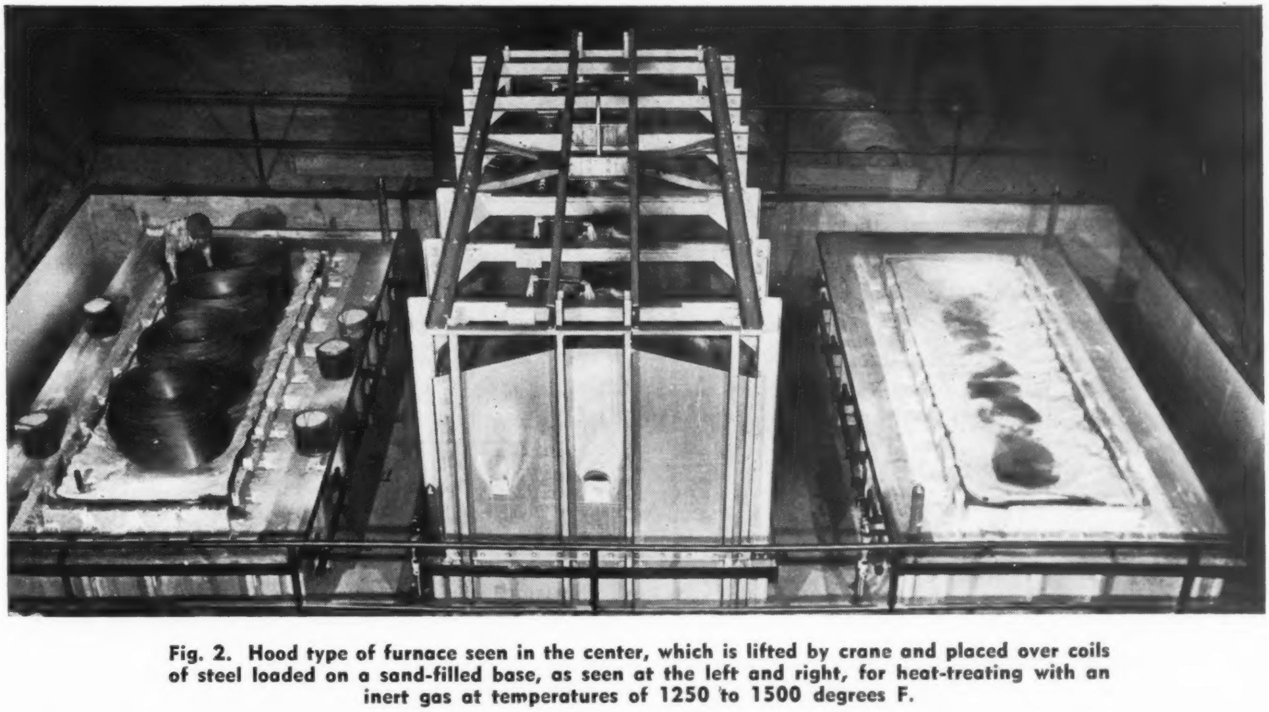


Fig. 2. Hood type of furnace seen in the center, which is lifted by crane and placed over coils of steel loaded on a sand-filled base, as seen at the left and right, for heat-treating with an inert gas at temperatures of 1250 to 1500 degrees F.

number of passes through molten lead. In one case, the steel is passed through a hardening bath of liquid lead at a temperature of 1550 degrees F., quenched in molten lead at 650 degrees F., cooled in air over a network of trolleys, and finally tempered in a lead bath maintained at 750 degrees F. A special products division in this plant produces Alnico magnets of many shapes and sizes, and includes a precision casting department.

* * *

Man-Au-Trol Motion Pictures Available from Bullard Co.

A film entitled "Three for One," showing the 30-H Man-Au-Trol horizontal lathe in operation, has been made available for authorized industrial group showings by the Bullard Co., Bridgeport 2, Conn. This is a 16-millimeter sound picture, requiring about eighteen minutes running time. Two other films on Bullard machines, one entitled "Man-Au-Trol—Master of the Machine" which shows the vertical turret lathe, and the other entitled "Bullard Pioneers Interchangeability without Jigs," showing the Bullard spacer, are also available.

Dial Feeds for Punch Presses

Improved dial-feed presses manufactured by the Federal Press Co., Elkhart, Ind., are said to enable an operator to handle four to six times as much work of certain types as he can handle on a conventional press. The dial feeds are built for use in performing numerous secondary operations, such as redrawing, piercing, stamping, broaching, wiring, punching and burring, etc., on blanks or shells that have previously been blanked and drawn. The presses thus equipped can also be employed for many assembling, riveting, and closing operations on finished parts.

These dial feeds can be set to perform several operations in sequence. In such cases, it is advisable, first, to balance the operations, so that the strain on the slides will not be excessively off center, and second, to provide separate adjustments for the height of the punches.

In a typical installation, the operator places shells in bushings, such as the one shown at *A* in Fig. 1, or on posts at the front of the dial. From this point, they are carried around into accurate alignment with the punch or punches and after the operation are either mechanically ejected, picked off, or dropped through the base.

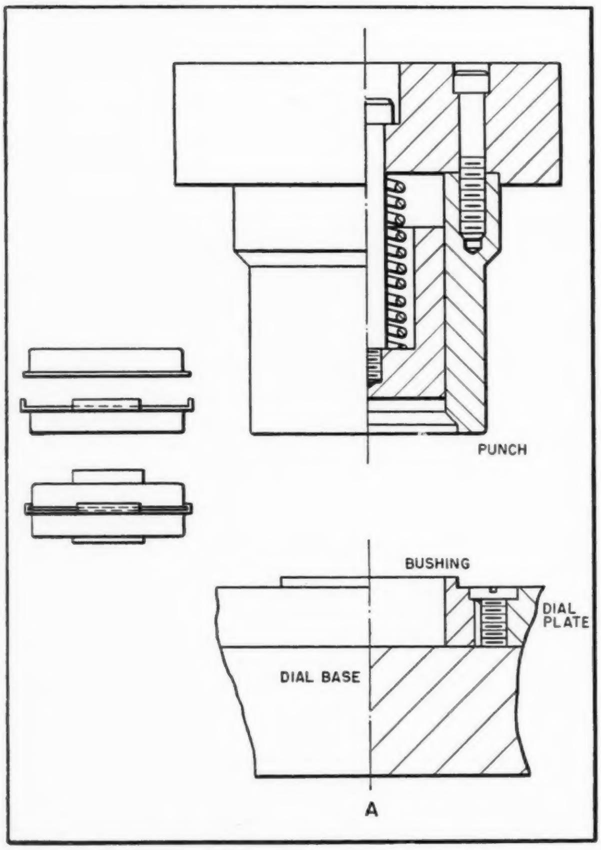


Fig. 1. Details of punch and die, showing arrangement of work-holding bushing on dial base developed by Federal Press Co.

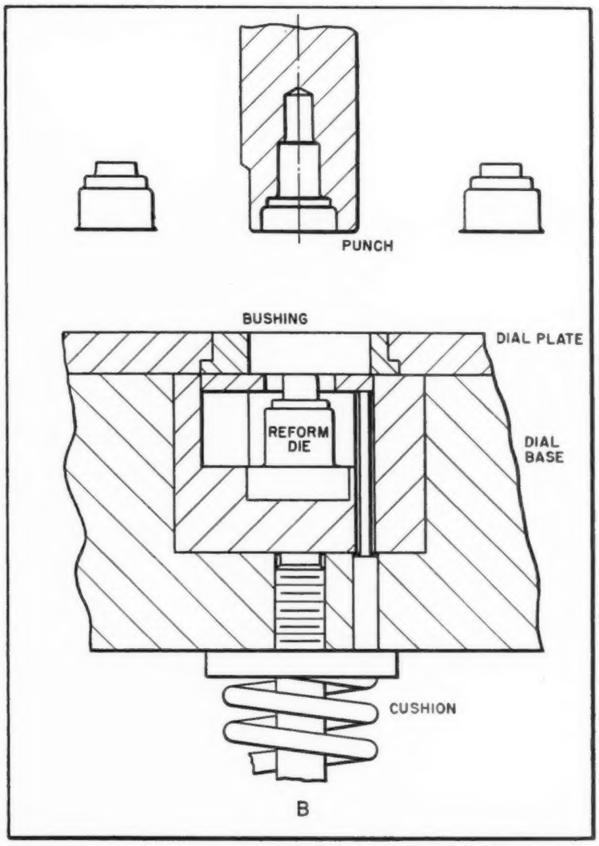


Fig. 2. Details of feeding dial manufactured by the Federal Press Co., in which a die is located in a recess in the dial base

With these feeds, an unskilled operator can feed a piece of work to the dial at every stroke of the press while it is operating continuously at the full speed of approximately 60 strokes per minute. In operating at a reduced speed, it is advisable to use a geared press. If the operation is very light, a flywheel type press can be employed.

At 60 strokes per minute, the operator can easily handle 3000 to 3500 pieces per hour, compared with approximately 600 to 800 on a single-operating die press without the dial feed. For fully automatic operation, dial feeds of this type are sometimes arranged with chutes or hoppers to supply the shells to the dial stations. Also, they can be fitted with roll feeds to handle the strip from which the shells are blanked and cupped preparatory to operations on the dial. Only in unusual cases, however, does the quantity of parts to be produced warrant the use of such equipment.

These dial feeds are built so that each station in the dial lines up accurately with the center line of the slide, making it unnecessary to provide any locking device for the dial. The dial is indexed by a cam and is always positively controlled. Each of the dial stations can be fitted with a bushing, fixture, or die, as the job requires, the die often being mounted in a recess in the dial base, as shown at *B* in Fig. 2. All moving parts are enclosed, and there is no skipping.

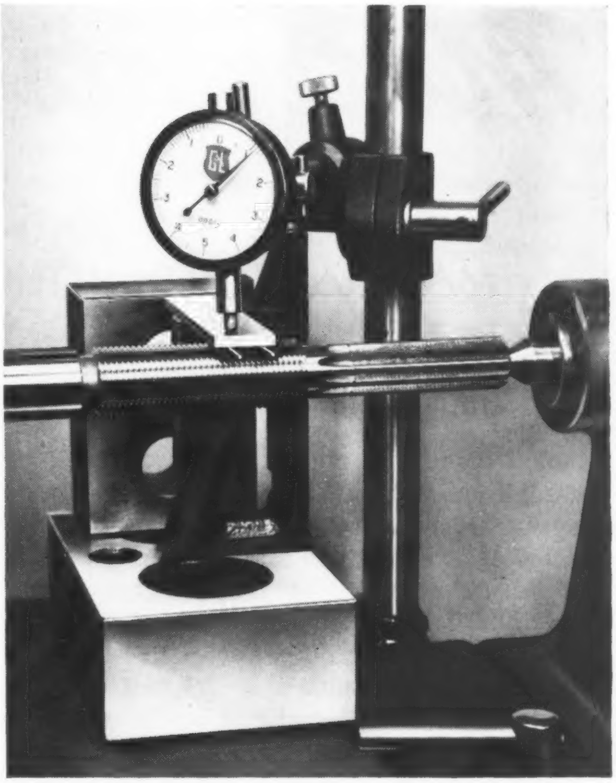
* * *

Wall Chart of Tap Drill Sizes

A wall chart, 13 by 19 inches, giving tap drill sizes is being distributed by the South Bend Lathe Works, South Bend 22, Ind. The chart covers American National Screw Thread Pitches as established by the National Screw Thread Commission authorized by Congress in 1928 and subsequently approved for general use. Sizes of threads, threads per inch, outside diameter of screw, tap drill sizes, and decimal equivalent of drill sizes are given for National Coarse Standard Threads (NC), formerly USS; National Fine Standard Threads (NF), formerly SAE; and Special Threads (NS). Charts can be obtained at 10 cents each by writing to the company at 383 E. Madison St., South Bend 22, Ind.

* * *

Motor vehicle companies are by far the largest customers of the machine tool industry, buying a third of the total output of that industry.



Simple method of accurately checking the run-out of the thread pitch diameter on a tapping spindle

Checking Pitch Diameter Run-Out of Threaded Shafts

A method of checking run-out of the pitch diameter of threaded shafts quickly and accurately without special equipment has been devised by E. P. McKitrick, chief inspector of The Cross Company, Detroit, Mich. The illustration shows how the method is applied in checking the concentricity of a ground thread on a tapping spindle.

As the tapping spindle is revolved, the two wires follow the lead of the thread and hold their longitudinal position due to the fact that the back ends of the wires are held against the face of a planer gage. In taking an indicator reading, best results are obtained by reversing the rotation of the spindle a slight amount after every third of a turn. This action draws the back ends of the thread gaging wires away from the planer gage and permits them to nest in the thread without interference.

* * *

A precision gage laboratory for checking the accuracy and quality of components of master models for mass production has been established at Stanford University, Stanford, Calif. The facilities are available to firms and individuals.

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Lubricant Developed for Use on Machine Ways

A lubricant for use on all kinds of machine ways—hardened steel, chilled cast iron, or laminates—has recently been developed by the Beacon Laboratories of the Texas Co., New York, N. Y. An extended series of field experiments has proved that the use of this lubricant, known as "Way Lubricant D," will eliminate the chattering that sometimes occurs at the beginning of the tool stroke.

The new product will not squeeze or press out, either when the machine is in motion or standing still, so that the oil film remains constant and desired precision of operation may be maintained. It will not corrode steel and copper and will not plug filters. It possesses low static and running coefficients of friction. 201

Metallic Gallium Now Available in Limited Quantities

Gallium—a rare silvery-white metal of unique properties—is now being placed on the market by the Aluminum Co. of America, Pittsburgh 19, Pa. This unusual metal is liquid on a warm summer day, having a melting point of 86 degrees F. The liquid metal may be held for some time at temperatures almost as low as the freezing point of water without solidification taking place.

Though similar to aluminum in its chemical behavior, gallium is not a light metal. Its density (5.9) is about twice that of aluminum, but only about half that of metallic mercury, which is also liquid at room temperatures. Like water, but unlike most elements, the density of gallium is greater as a liquid than as a solid; gallium actually expands on solidifying.

Gallium wets many types of non-metallic surfaces, such as glass and porcelain. As in the case of aluminum, a protective natural oxide film forms readily on the surface. Even when heated to temperatures as high as 1000 degrees F., a globule of gallium will remain bright and shiny. This combination of properties should make this metal suitable for a variety of unusual applications. 202

Low-Temperature Bronze-Base Repair Alloy

A low-temperature bronze-base permanent repair alloy for use in industrial repair and maintenance applications is being distributed by the John Hewson Co., 70 Wall St., New York 5, N. Y. This repair alloy, called "Lo-Temp," can be handled like putty at 300 degrees F. and fuses with the metal surface under repair. An ordinary gasoline torch and a putty knife are the only equipment necessary for making repairs.

The finished repair can be machined, filed, drilled, and tapped. The alloy will not corrode, run, crumble, shrink, or dry out, and can be applied to any metal except aluminum or its alloys. 203

Stainless Steel Clad Sheets Suitable for a Variety of Applications

Sheets of stainless steel which have been inseparably welded to a mild steel backing are now being marketed under the trade name "Permaclad" by the Allan Wood Co., Conshohocken, Pa. These sheets provide, on one side, the maximum corrosion resistance of stainless steel and yet possess the ductility and other desirable physical properties of plain carbon steel. They can be subjected to a much deeper draw without annealing than stainless steel, and can be arc-welded, spot-welded, or soldered with ease and safety. The superior conductivity of the mild steel backing rapidly dissipates welding heat and minimizes the danger of destroying the stainless properties. Polished "Permaclad" can be drawn or stamped without injuring the surface if protected by a plastic coating. ...204

Butaprene-Based Rubber Compound for Sub-Zero Applications

The Stalwart Rubber Co., 157 Northfield Road, Bedford, Ohio, has announced a Butaprene-based rubber compound that can be exposed to low temperatures for prolonged periods of time without loss of flexibility. The new compound looks and acts like conventional rubber except for its ability to withstand the effects of temperatures as low as —50 degrees F. It has a permanent set of 4 per cent, a specific gravity of 1.25, and a durometer hardness of 55.

Other important features of the compound include ability to resist fats, dilute acids, alkalies, petroleum products, hydrocarbons, and solvents, and resistance to oxidation at high temperatures. This new rubber compound can be extruded, machined or punched, and molded...205

New Ductile Cast Iron Available to Industry

A new engineering material described as ductile cast iron, which combines the fluidity, castability, and machinability of gray iron with the advantages of cast steel, has been developed by the International Nickel Co., New York City. This material is characterized by a graphite structure in the form of spheroids rather than in flake form. Its excellent physical properties, particularly its high elastic modulus, yield strength, and ductility, suggest its suitability for many applications hitherto considered beyond the scope of cast iron.

Common cast iron compositions, as melted in the cupola or in other kinds of furnaces, can be used in producing this iron. A small amount of magnesium or a magnesium-containing addition agent, such as nickel-magnesium alloy, is introduced in the iron to provide the required properties.

A number of foundries have already arranged licenses for the manufacture of the new cast iron under the pending patent applications of the International Nickel Co. 206

"Kel-F"—A High-Temperature Plastic—Now Produced Commercially

Commercial production in limited quantities of "Kel-F," an unusually stable, high-temperature thermoplastic, has just been announced by the M. W. Kellogg Co., Jersey City, N. J. In its natural state, this plastic is colorless and transparent, although it can be blended with solid fillers and coloring agents. It maintains satisfactory properties in the temperature range of —320 to 390 degrees F.

Pump packings, valve seats, and valve packings, subjected to corrosive gases and liquids offer potential applications of this material. Its transparency makes it an excellent substitute for glass in gage glasses, flowmeters, etc., where glass would be attacked. The low cold-flow characteristic of "Kel-F" makes it an excellent medium for gaskets, valve seats, pump diaphragms, and all other uses where a resilient material is desired, whether or not chemical inertness is required. A particularly useful application is as a seating material for air or gas pressure safety valves, where the constant spring-loaded pressure closing the valve is likely to produce cold-flow in the seat...........207

To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on these pages, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning name of material as described in April, 1949, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on the blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME...POSITION OR TITLE.................................

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM...

BUSINESS ADDRESS...

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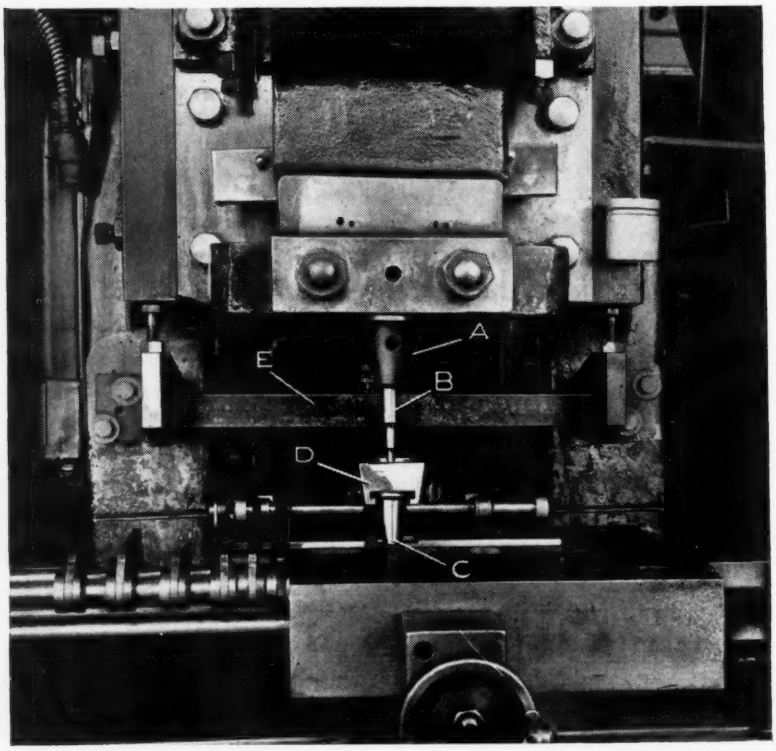
Punch Press Safety Device

By T. E. TYLER, Manufacturing Staff Assistant
Electronics and X-Ray Division
Westinghouse Electric Corporation, Baltimore, Md.

A safety device developed by the Baltimore Works of the Westinghouse Electric Corporation for use on punch presses consists of a sleeve that surrounds the punch in operation, thus permitting the operator to place his hands close to the tool without danger. The sleeve also acts as a stripper.

This device is used when piercing holes in flat materials, such as sheet steel, aluminum, or brass. The holes to be pierced may be round, square, or irregular in shape. The sleeve is made to conform as nearly as possible with the contour of the punch.



A clearance of 1/32 to 1/16 inch is maintained between the diameter of the punch and the inside diameter of the sleeve, depending on the thickness of the material being punched. When the material is very thin, a minimum clearance should be used; otherwise, the material would have a tendency to be pulled up by the punch on the up stroke.

The safety device described was designed for punches up to 1 inch in diameter. However, with proper modification, the same idea can be used for much larger punches. The punch-holder, as shown at *A* in Fig. 1, is of standard design. The punch *B* has a shank diameter of 3/4 inch and is held in the holder by means of a set-screw, as shown in Figs. 1 and 2. The steel sleeve shown at *C* in Fig. 1, has a top flange for mounting purposes.

The arm *D* is also made from steel. One end of this part is machined to fit the sleeve, while the other end is assembled to the support *E* by means of the arbor and nut assembly shown at *F* in Fig. 2. The support is secured to and extends across the bed of the machine. A locking pin assembly *G* is used in the support to hold the arm at right angles. By lifting this pin, the arm can be swung out of position either to the right or left of the press uprights. The whole assembly is mounted to the upright members of a punch press.

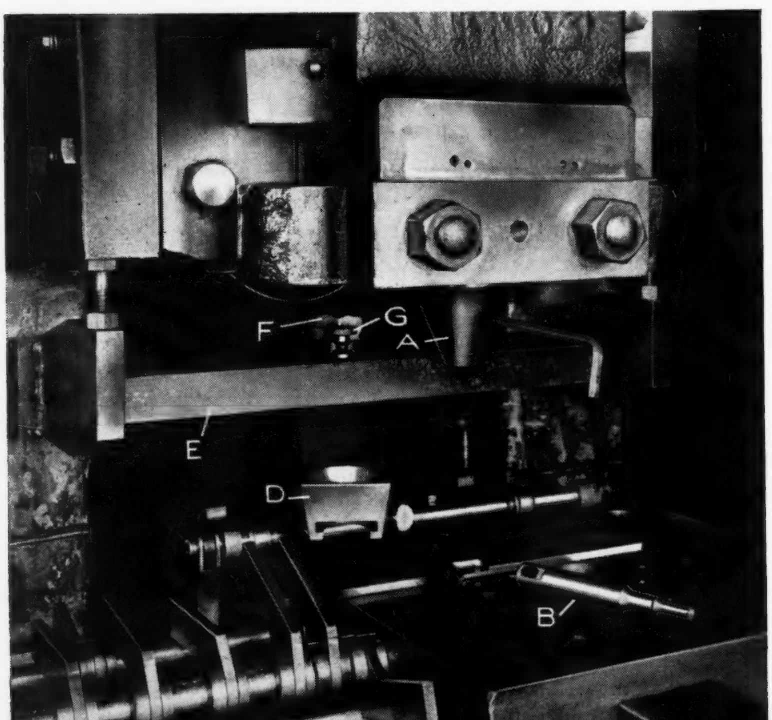
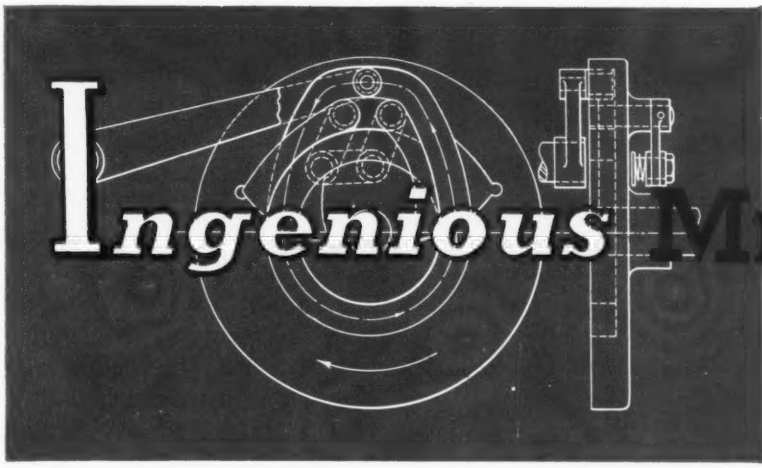


Fig. 1. (Above) Safety device attached to press includes a sleeve surrounding the punch, which enables the operator to place his hands close to the punch without danger

Fig. 2. (Left) Punch press safety device partially disassembled to show component parts



Ingenious Mechanisms

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and other Devices

Hydraulic Mechanism for an Abrasive Cut-Off Machine

By GEORGE H. DeGROAT

In a plant where the cutting of tungsten rod is the basic step in manufacturing automotive contact points, hydraulic operation of an abrasive cut-off machine offered a means of materially increasing production at a comparatively low cost. The process previously consisted of feeding the tungsten rod to an abrasive cut-off wheel in a manually operated machine. The rods, approximately 6 feet long and ranging from 0.150 to 0.250 inch in diameter, are cut to lengths as small as 0.022 inch with a tolerance of ± 0.002 inch.

Before installation of the hydraulic equipment shown in the illustration (see next page), the machine consisted primarily of a motor-driven abrasive grinding wheel and spindle mounted on an arm that pivoted under pressure from a foot-treadle, thus feeding the abrasive wheel into the rod. The rod was fed by hand along a supporting table to a stop which was pre-set for the desired length of work-piece. The abrasive wheel employed was 6 inches in diameter, with a thickness of approximately 0.015 inch, and was permitted to wear to 3 inches in diameter before being replaced.

With these manually operated machines, no accurate data regarding the rate of wheel wear per cut were available and production rates varied. The installation of the hydraulic equipment provided fully automatic operation and permitted higher, constant production, as well as closer control over wheel inventories through accurate wheel-life data.

The hydraulic circuit consists of an electric motor-driven pump *A;* an oil-reservoir tank *B;* a pressure relief valve *C;* a double solenoid-operated, four-way directional control valve *D;* a needle valve *E;* a check-valve *F;* a double-acting hydraulic cylinder *G* with a 2 to 1 differential; limit switches *H* and *S;* and a motor starter and overload relay *K*, which can be connected to the machine circuit-breaker. The total cost of this additional equipment was approximately $360.

The arm on which the wheel-spindle is mounted is provided with a counterbalance *L* and a suitable connecting link *M* to the hydraulic cylinder *G*, which can be installed in a vertical position on the under side of the machine table. The abrasive cut-off wheel *N* is held on the opposite end of the counterbalance. The needle valve *E* admits a regulated rate of flow of hydraulic oil into cylinder *G* on its up stroke, thus providing an adjustable rate of wheel travel to the work. The check-valve *F*, which prevents the flow of oil from by-passing the needle valve, permits the free flow of oil out of the cylinder on the down stroke. The 2 to 1 differential ratio of the hydraulic piston affords a fast return of the cut-off wheel. Limit switches *H* and *S* are actuated by adjustable tripping dogs *O* on the counterbalance, and control the solenoid-operated four-way valve *D*. This valve directs the flow of oil to either the bottom or top of the cylinder for the cut-off or return stroke, respectively, depending upon the position of the counterbalance arm.

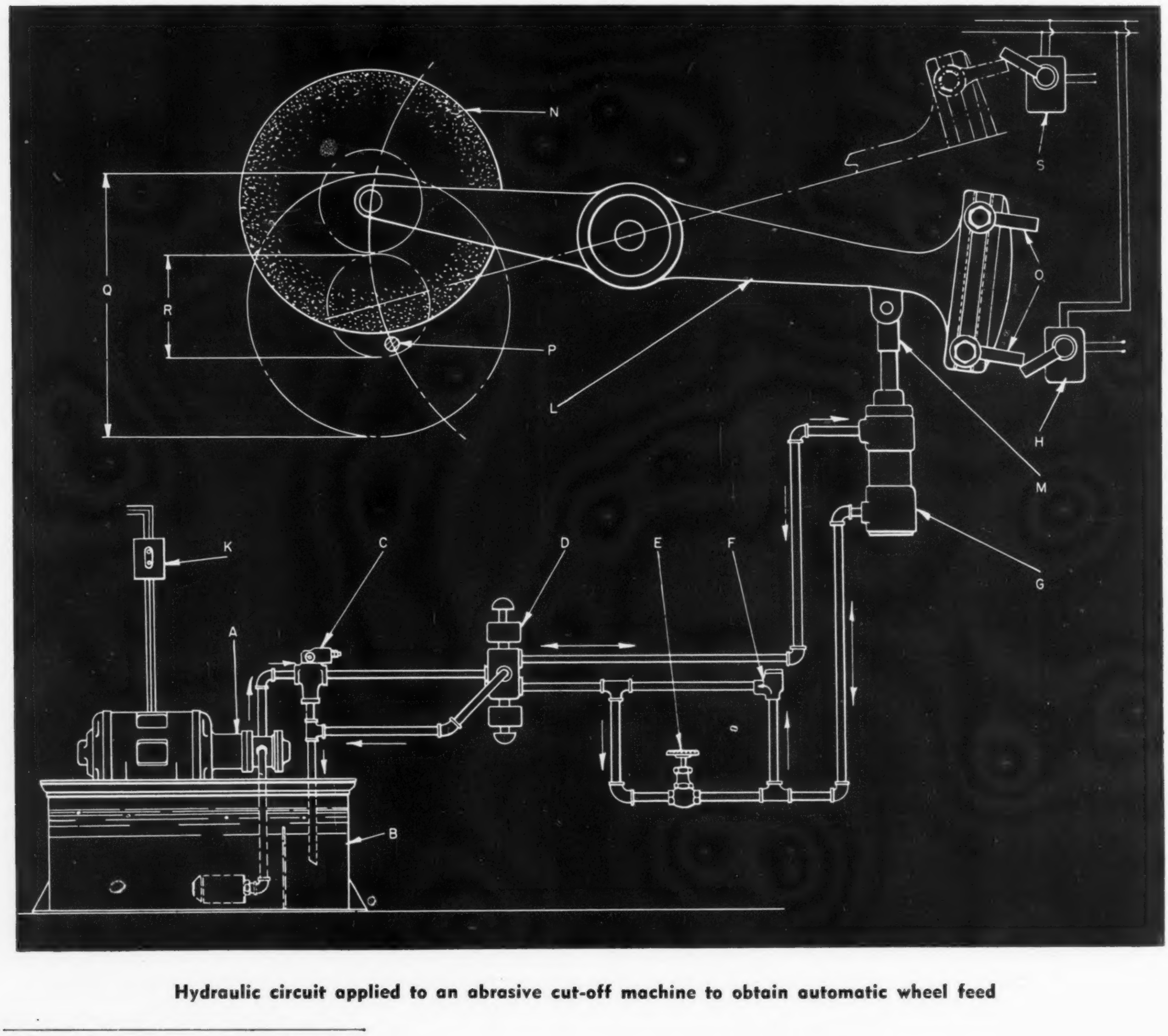
In order to compensate for wheel wear, it is necessary to use a cylinder of sufficient stroke to accommodate the difference in radii between a new wheel and the smallest diameter permissible on a worn wheel. In addition to this, the work diameter and the wheel clearance on both sides of the work must be considered. A 6-inch diameter wheel *N* is shown starting 1/16 inch above a 0.156-inch diameter rod *P*. After passing through the work and traveling a distance of

1 17/32 inches beyond, disregarding the minor difference between the arc of travel and a straight line, the wheel will be in the position indicated by dimension *Q*. As the wheel wears and the stroke remains constant, the distance the wheel passes beyond the work decreases until it becomes about 1/32 inch with a 3-inch diameter wheel, as indicated by dimension *R*. Also, the starting distance above the work is increased to 1 9/16 inches. With a 1 to 1 lever ratio, it is necessary to have a piston stroke of about 1 3/4 inches to clear work 0.156 inch in diameter. Unnecessary travel of the wheel decreases on the under side of the work and increases on the upper side as the wheel wears.

To eliminate this unnecessary wheel travel, an automatically adjustable piston stroke can be used by employing a timer in conjunction with the directional control valve. However, accurate data on wheel wear per cut are necessary for efficient selection and setting of a timer, and this can only be determined after actually using the hydraulically operated set-up for some time. The timer can then be added to the circuit, and the limit switch arrangement removed.

The time cycle for the set-up shown is arranged for a constant production rate of twenty pieces per minute, which allows three seconds per cycle. The rod feeding device (not shown) is solenoid-operated and is controlled by the upper limit switch *S*, which permits the feeding action to consume approximately one-half of the cycle time. Thus, 1 1/2 seconds are allowed for the wheel feed through the rod, and the return stroke is accomplished in about 1/2 second. A dwell period of one second is provided to allow for the completion of the stock feed, which begins at the end of the wheel feed stroke.

When it is desired to operate several machines, a central control panel and a single pump and tank unit can be installed to operate the system. The hydraulic circuit illustrated can be applied to each machine, with the addition of such valves as may be necessary (depending upon the number of machines), to prevent total shut-down in case of trouble with any one machine.



Hydraulic circuit applied to an abrasive cut-off machine to obtain automatic wheel feed

Tool Engineering Ideas

Tools and Fixtures of Unusual Design, and Time- and Labor-Saving Methods that Have been Found Useful by Men Engaged in Tool Design and Shop Work

Automatic Mechanically Operated Milling Fixture

By ROBERT MAWSON, Providence, R. I.

The advantages of automatic fixtures are obvious. With hand-operated fixtures, the time required for inserting the piece, removing the finished part, resetting the fixture, and feeding the cutting tools reduces the rate of production and thereby increases unit cost.

The fixture used for milling the part shown in Fig. 1 is of special interest because, once the part is located and fastened in place, no manual labor is required until the milling operation is completed. Automatic indexing is accomplished by a unique system of levers that utilizes the reciprocating motion of the milling machine table to rotate and lock the work in position.

The part that is machined is a cast-iron cone tube-holder for a textile machine. It is first turned to the correct outside dimensions in a lathe and is then drilled and reamed as indicated in the drawing. The next operation is milling eight 3/32-inch evenly spaced slots around the tube-holder with a 4- by 3/32-inch slotting saw. For this operation, the fixture shown in Fig. 2 is used. It has a cast-iron base *A* to which are fastened by fillister-head screws two steel tongues *B*, machined to a good fit in the slots of the milling machine table. At each end of the base is a slot to receive bolts for fastening the fixture on the machine table.

The fixture base is bored and reamed to accommodate the bronze bearing *C* in which is placed a steel locating arbor. The lower portion of the arbor is machined to a running fit in the bearing, while the top portion is made a close fit in the reamed hole in the cone tube-holder. A steel ratchet *D* is fastened to the arbor, below the bearing, with a Woodruff key; and the entire assembly is held in place by a hexagonal nut. The hardened steel feeding lever *E* and the steel locking plug *F* are also fastened to the base with round-head machine screws which act as pivot points when the fixture is in operation.

In the bronze bearing *G*, which is driven into a reamed hole in line with the center of the arbor, is fitted a hardened steel locking plug *H*; this locking plug is designed at the forward end to be a good sliding fit in the notches of the ratchet, and has a recess milled in it to receive the lower end of lever *F*. An opening is also provided for this lever on the upper surface of the bushing *G*. This construction is more clearly seen in the end view of Fig. 2.

At the outer end of plug *H* is a spring *J*, which is held in position by a steel plate that is fastened to the base. On the other side of the fixture is a steel pawl *K* which is held in contact with the ratchet by means of spring *L*.

A cast-iron bracket *M*, attached to the vertical column of the milling machine, actuates feed-lever *E*. The bracket is provided with a yoke *N* which, in turn, is equipped with a steel pin on which the hardened steel roller *O* revolves. Yoke *N* is fitted in a reamed hole in the bracket and is held in place by a set-screw; thus, it can be adjusted in or out to make contact with the feed-lever.

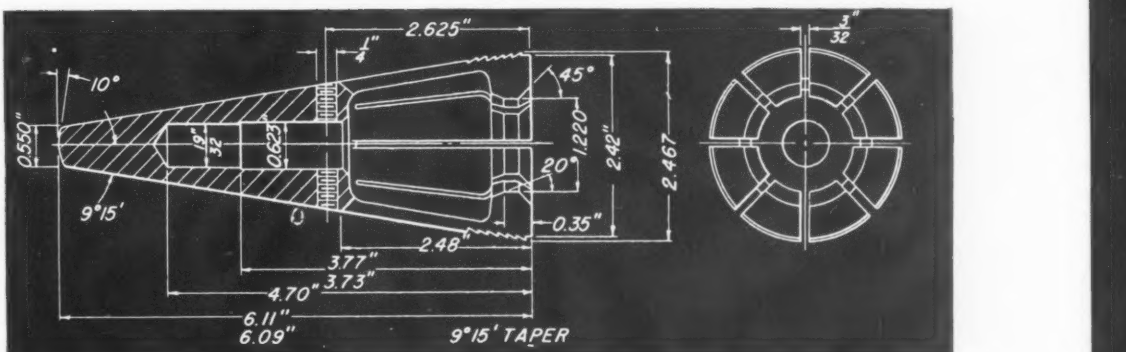
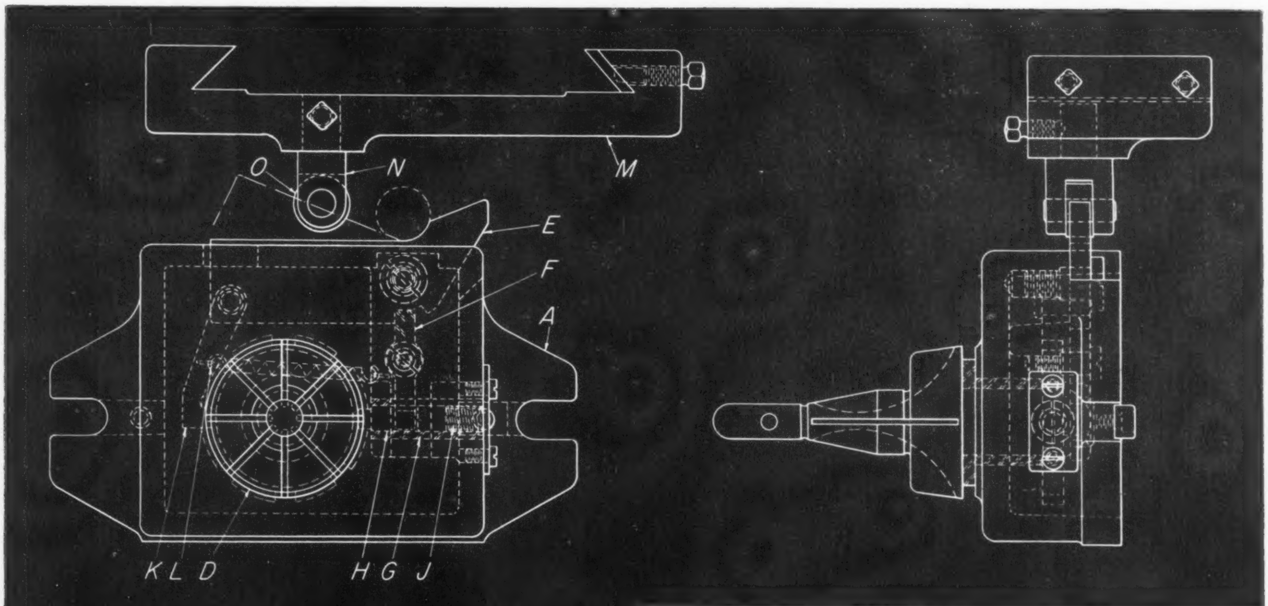


Fig. 1. Cone tube-holder for a textile machine which was milled by the use of the automatic fixture shown in Fig. 2



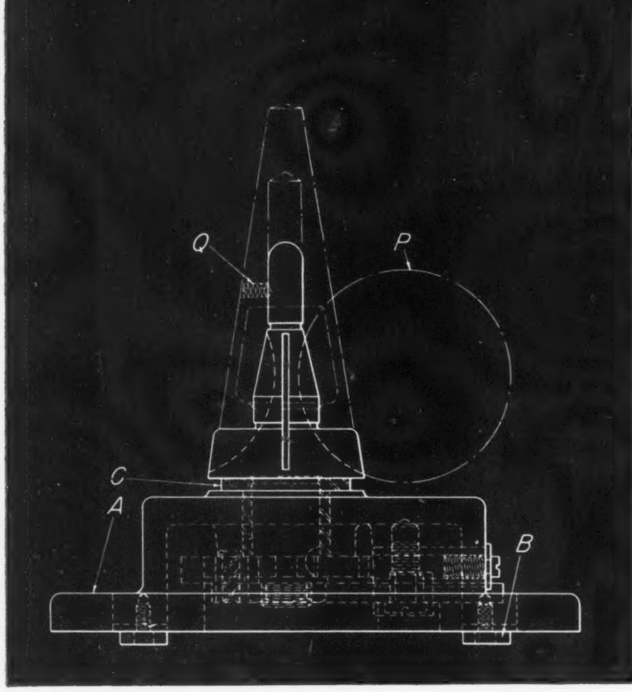


Fig. 2. Automatic fixture designed for milling eight evenly spaced slots in the textile-machine part illustrated in Fig. 1

In setting up this fixture, bracket *M* is fastened on the inside of the vertical column of the milling machine, and base *A* is attached to the machine table. The height of the machine table is adjusted so that the cutter (indicated at *P*) is in the correct position to machine the slots, and the stops on the table are so adjusted that the roller *O* will make proper contact with lever *E* at the end of the table travel. One of the cone tube-holders is then placed on the locating arbor and fastened in position by the set-screw *Q*.

When the machine is placed in operation, the table travels to the left thus moving the roller from the position shown to that indicated by the dotted line. When the roller is in this location, lever *E* is pivoted around its holding screw, so that its left-hand end is raised. As the lever moves upward, the pawl *K* is disengeged from the ratchet wheel. Continued travel of the machine table moves the roller onto the bevel surface of the lever and the notch on the lower surface of lever *E* comes in contact with the upper end of lever *F*. Further movement of the table pushes lever *F* back which, in turn, forces the locking plug *H* out of the notch in the ratchet wheel.

The direction of table travel is then reversed by the stops, and the table moves to the right. The roller remains in contact with lever *E* and forces it downward as soon as its point of contact is to the left of the pivot point of the lever. This motion brings the lower end of pawl *K* in contact with a notch in the ratchet wheel. As the table continues its travel to the right, pawl *K* is pushed down, rotating the ratchet wheel.

After the ratchet has been rotated a short distance, the locking plug *H* is released by the notch in lever *E* coming in contact with lever *F*. Plug *H* then rides on the outer edge of the ratchet wheel until the rotation of the wheel brings a notch under the plug; the plug then enters the notch and locks the assembly in place. In this position, the cone tube-holder is correctly located, and as the machine table continues its motion toward the travel reverse stop, the cutter *P* cuts the slot.

This cycle is repeated until all eight slots have been milled. The finished cone tube-holder is then removed from the locating arbor by loosening the set-screw *Q*.

Designing Parts for Economical Die Production

By FEDERICO STRASSER, Santiago, Chile

Small modifications in the design of parts to be produced in dies often eliminate difficulties in operation of the presses; save considerable material, labor, and time; and increase the rate at which parts can be produced. Such changes may also result in lower die cost.

Some typical examples of parts that have been redesigned in order to obtain greater production economy are shown in the accompanying illustration. The bracket shown at *A* required a progressive piercing and blanking die so designed that a large amount of the strip stock was wasted. By changing the shape of the part as shown at *B*, yet maintaining the relative position of the three holes, a simple piercing and shearing die was employed. This enabled many more parts to be produced from the same amount of stock.

A similar case is illustrated at *C* and *D*. The part shown at *C* was originally forged. When it was decided to produce it on a press, the part was redesigned as shown at *D* to eliminate the large amount of scrap loss that would otherwise result. Other examples of clustering of parts to obtain more efficient use of strip material are shown at *E* and *F*.

Another form of scrapless die results from the punching of two or more different parts simultaneously. Well-known examples of this type of die are lamination dies for electric motors in which the outer ring that is blanked forms the stator lamination and the inner blank forms the rotor lamination. This practice was carried out in designing the die for the parts shown at *G*. These two parts are used for the manufacture of electric lamp sockets. They are made on a progressive die in which the two holes in the central punching are punched in the first stage, the three additional holes punched and the center slug blanked out in the second stage, and the piece sheared off in the third stage.

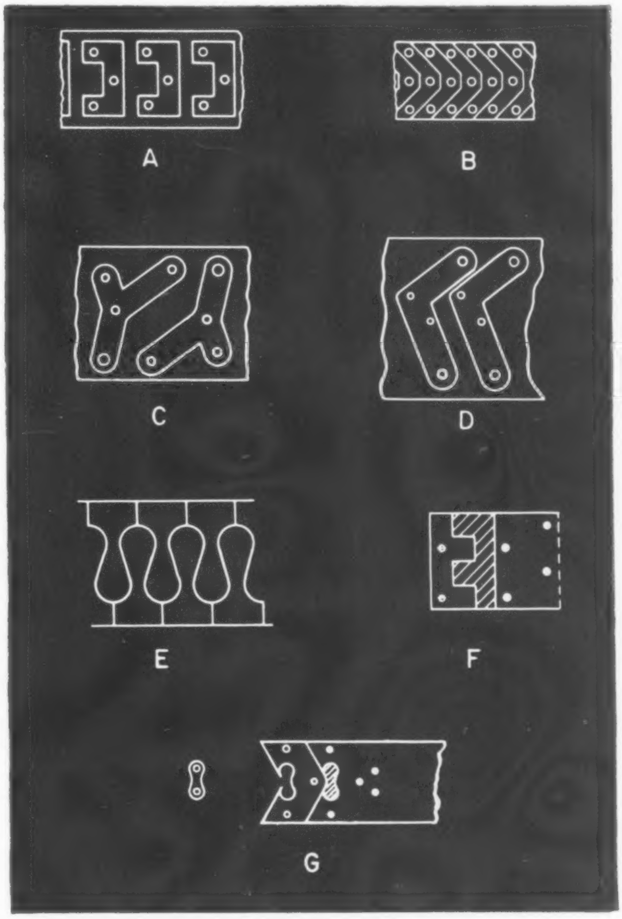
If possible, in the design of such parts, the holes should be made circular rather than irregular or rectangular in shape, because dies for round holes are not only easier to machine, but also to maintain. Also, the holes should be made large enough to permit effective punching; in the case of hardened tool-steel punches and dies, the hole diameter should be approximately equal to or greater than the thickness of the material being punched. The factors that govern the minimum hole diameter are the type of material used in the punch, the construction of the die, and the thickness and shearing strength of the material being punched.

Lathe Dog for Gripping Narrow Shoulders

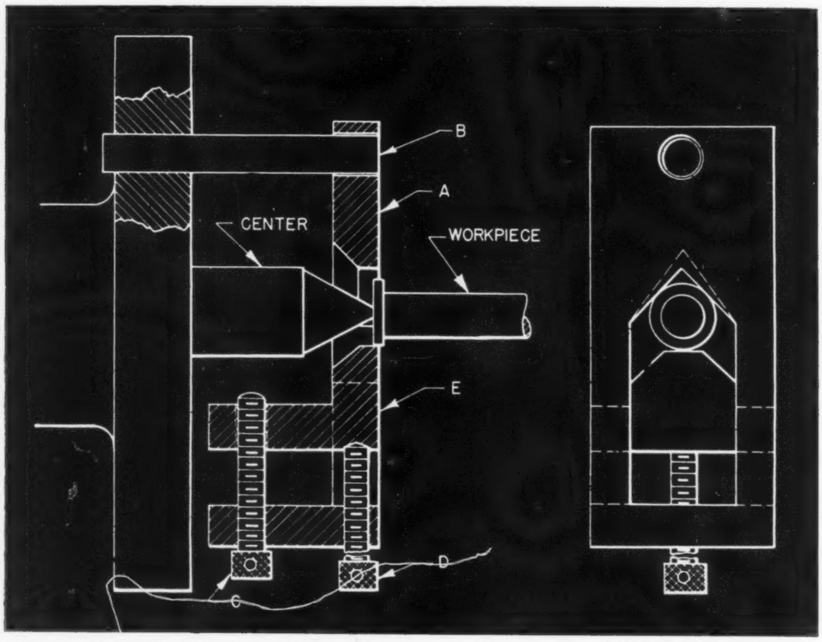
By H. MOORE, Kirkstall, Leeds, England

Parts with narrow flanges can be turned readily if a lathe dog is used that grips securely and yet leaves the face of the flange exposed for machining. One type of dog that fulfills these requirements is shown in the accompanying illustration; it combines the features of an adjustable tap wrench and a parallel clamp.

The body *A* is squared and a vee machined in it which is tapered on the inside to clear the lathe center when small pieces are held. It is drilled to receive rod *B* and screw *C*, and drilled and tapped for screw *D*. The jaw *E*, which slides in the slot in the main body of the dog, is tapped and dimpled for the tightening screws.



Examples showing parts redesigned to permit more effective punch press operation with less scrap loss



The lathe dog here shown is used to grip the work when a narrow flange is to be turned, as it holds the part securely and yet leaves the face of the flange free for machining

In practice, both screws are adjusted until the work is held tightly. It may be seen that while the main function of screw *C* is to resist the thrust, it also acts on the lever part of the jaw similarly to a clamp, thus adding extra pressure to hold the work in place.

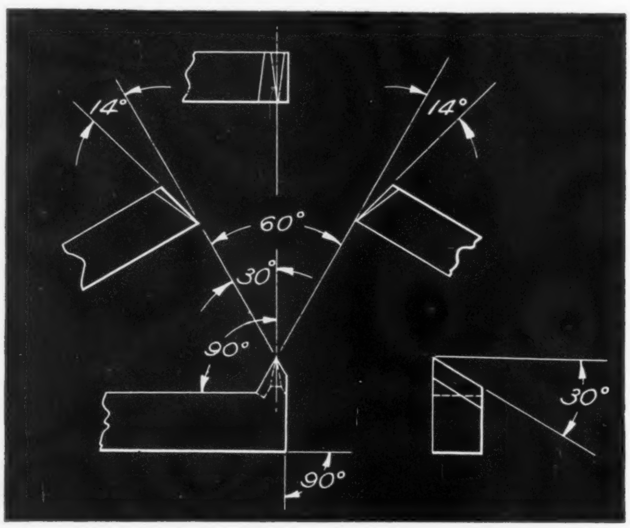
Internal Threading Tool Designed to Eliminate Set-Up Gages

By W. G. HALLAM, Detroit, Mich.

One of the principal methods of cutting internal threads in lathes is by means of single-point tools. A number of successive cuts are generally required to form a complete thread, depending upon the pitch of the thread and the corresponding depth of thread groove. Ordinarily, a lathe operator backs his tool out and re-engages it with the thread for recutting at a slightly increased depth of cut.

To eliminate set-up gages and to facilitate picking up and recutting of internal threads, the tool shown in the accompanying illustration was designed. This tool is very rigid, and it can be used for right- or left-hand threads simply by changing the top rake.

With this tool, set-up gages are unnecessary because the front face is ground square with the shank for use as a set-up reference surface, and the cutting edge is ground at a 30-degree angle with this face. Inasmuch as the point of the tool is at right angles to the shank, the tool can be fed straight into the work, without setting the compound rest at an angle.



Single-point tool for internal threading that eliminates set-up gage

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In a new engine plant built by one of the large automobile companies, attention has been given to the psychological effect of color on the workers. All machinery and walls are painted a restful green; ceilings are white. Pleasing colors, such as blue, red, yellow, and silver, are used to mark switches, pipes, and aisles. To test the workers' reactions, the firm left one corner of the plant and its machinery unpainted. It was found that workers in the painted section of the plant wore good clothes and kept their surroundings spotless, while those in the unpainted section wore cover-alls or old clothes and needed constant urging to keep their work areas clean.

Questions and Answers

A Department in which the Readers of MACHINERY are Given an Opportunity to Exchange Information on Questions Pertaining to the Machine Industries

Verbal Contract Verified by Correspondence

A. C. T. — We contracted verbally to make delivery of a certain number of machine tools monthly for one year. Later, by correspondence, the term of this contract was increased to three years. We desire to break the contract, and understand that it is void under a law known as the Statute of Frauds. Can we cancel this contract?

Answered by Leo T. Parker, Attorney at Law, Cincinnati, Ohio

It is a universal law that verbal contracts which cannot be performed within one year are rendered void by the Statute of Frauds. However, according to a recent higher court decision, a verbal contract verified by correspondence automatically becomes a written contract and is valid.

In one case (Illinois [52 N.E. (2d) 47]) it was reported that a buyer and a seller entered into a written contract for the sale of machinery. The term of the contract was for one year. Later they made a verbal contract, almost identical in terms, except for the provision that the original contract was to be extended from one to two years. Many letters passed betweeen the parties in which the verbal agreement was mentioned.

The buyer broke the two-year contract, and the seller filed suit for damages. The buyer defended on the grounds that the agreement was oral and void under the Statute of Frauds because it could not be performed within one year. The higher court, however, held that the correspondence verified the verbal agreement, and the contract was legally a "written" one. Therefore, it is my opinion that you cannot avoid fulfilling your contract by pleading the Statute of Frauds.

Arc-Welding of Magnesium

N. S.—Is it practical to arc-weld magnesium on a production basis, and if so, what would be the strength of the joint, compared with the strength of the parent metal?

A.—Magnesium alloys can be joined by fusion welding methods, using either a gas or a tungsten arc. The largest proportion of welding done on magnesium is by tungsten arc using the Heliarc process, with either helium or argon as an inert-gas shield over the weld area.

The equipment necessary consists of a standard direct-current arc-welding generator or rectifier with variable current control in the desired range and the required helium or argon gas apparatus; or the more recently adopted high-frequency alternating-current equipment can be used, which gives better control of the current and results in more uniform welds. Magnesium filler rods of alloy C, FS-1, H, J-1, M, and O-1 are available in rod diameters of 1/16, 3/32, 1/8, 5/32, 3/16, and 1/4 inch. No flux is required with the Heliarc process.

The accompanying table, compiled by the Dow Chemical Co., indicates the welded joint strength for various A.S.T.M. alloys.

Tensile Strengths of Arc-Welded Magnesium Alloys

Alloy		Form	Ultimate Strength, Pounds per Square Inch	
A.S.T.M.	Dow		Parent Metal	Welded Joint
M1	Ma Mh	Sheet Sheet	33,000 37,000	20,000 22,000
AZ31X	FS–1a FS–1h	Sheet Sheet	37,000 43,000	32,000 33,000
AZ51X	J–1a J–1h	Sheet Sheet	42,000 45,000	41,000 42,000
AZ31X	FS–1	Extrusion	40,000	34,000
AZ61X	J–1	Extrusion	45,000	37,000
AZ80X	O–1	Extrusion	49,000	35,000

* * *

The United States, once dependent on foreign sources for most of the ball and roller bearings on which the wheels of its industry turned, now is a leading supplier of anti-friction bearings to the rest of the world. According to William L. Batt, president of S K F Industries, Inc., approximately 10 per cent of the nation's output of bearings is now going to foreign markets.

Cost and Weight Advantages Obtained with a Welded Sheave

By A. T. SCANNELL, President
Archer Iron Works, Chicago, Ill.

Improved operating performance and reduced manufacturing cost of a machine element are difficult to obtain together, with present material shortages and generally higher costs. At the Archer Iron Works this dual objective has been achieved in the manufacture of large welded steel sheaves which have been used to replace cast-iron sheaves on mining and tunneling equipment built by the concern. The welded steel sheave is not only 60 per cent lighter than the cast-iron sheave, but is 68 per cent cheaper. Other advantages are greater safety, longer life, and the elimination of maintenance work normally required with the cast-iron sheaves.

One type of welded sheave made by the company is shown in the accompanying illustration. This sheave is 60 inches in diameter and is designed for use with a 1-inch steel cable. It operates at about 15 R.P.M., or at a hoisting speed of 250 to 300 feet per minute, and carries a load of 30 tons.

This sheave is made from 3- by 3-inch bar stock rolled into a rim, 1/2-inch thick flame-cut web plates with 3-inch ribs, and a cast-steel hub. The various pieces are tack-welded together without the use of jigs or fixtures because only small-quantity lots are made at a time. The sheave is then finish-welded. A 1/8-inch stringer bead is first run completely around the inside of the rim, and then a 3/8-inch weld is made all around the inside of the rim. A 1/4-inch diameter Fleetweld No. 7 electrode, made by the Lincoln Electric Co., is used for the operation. A 3/16-inch weld is made to join the ribs to the web, and a 3/8-inch weld is made around the hub.

All-welded steel sheave 60 inches in diameter that has replaced a cast-iron sheave

The finished weight of the sheave without a shaft or bearing is 1000 pounds, which is 60 per cent less than the cast-iron sheave formerly used. The sheave is turned after it has been welded, so that true alignment and balance are obtained. The factor of safety of the steel sheave is at least five times greater than that of the cast-iron sheave.

* * *

Non-Destructive Testing Apparatus Installed in Naval Ordnance Laboratory

The new Naval Ordnance Laboratory at White Oak, Md., is said to have the most complete installation of X-ray and other non-destructive testing apparatus of any laboratory in the world. The laboratory building contains eight X-ray rooms. One of these houses a 10,000,000-volt betatron and a 2,000,000-volt X-ray machine. The walls of this room are 3 feet thick, and the room is entered by a maze rather than a door, since the cost and time factors involved in opening and closing a huge 3-foot door would be prohibitive.

The purpose of the laboratory will be to set standards for non-destructive testing methods that will (1) make them more effective in raising the quality of ordnance and other military equipment used by the Navy; and (2) decrease the cost of non-destructive testing for the benefit of Navy suppliers. It will also do research on new techniques for X-ray and other non-destructive testing methods.

* * *

Metal Television Tubes Relieve Shortage

One of the major bottlenecks in the television industry has been the making of large glass hand-blown viewing tubes. Recently a method of speeding up the production of these tubes has been developed. By this method, high-chromium stainless steel (SAE 446) having about the same thermal characteristics as glass is spun to the shape of a viewing tube, and a glass end is then sealed to the metal.

THE SALES ENGINEER AND HIS PROBLEMS

By BERNARD LESTER Sales Engineering Consultant

Time—The Sales Engineer's Raw Material

TWO questionnaires have recently been received by the writer from persons who are trying to make a time study of the sales engineer at work. These questionnaires are based on an erroneous assumption; you can't check a sales engineer with a "stop watch" as you can a machine tool operator. His mind does not work by the clock or according to union rules.

But there is a lot every sales engineer can gain by studying how to schedule and spend his time. Time is the raw material the sales engineer works with. Careful planning of how time is to be spent will ultimately show results in the order book.

How does the machine tool salesman spend his time while on the job of selling? There are only four ways. Stated consecutively in the order of importance they are: (1) Actually in contact with customers and prospects; (2) traveling; (3) on home-office work and desk routine; and (4) on non-essentials—idle chatter, even loafing.

A supreme effort should be made to increase the actual time spent with prospects and customers because this is the most effective time—and in the average day it is all too short. This contact time should be divided on some definite basis, a certain proportion being devoted to immediate inquiries, another proportion to past purchasers, and still another to potential prospects. Neglecting any of these is ultimately fatal.

Each trip should be scheduled so that traveling time is made to count toward a number and variety of contacts. Even the emergency trip to a certain plant can be made to include more than one contact. "Doubling back" to the office is expensive. Be careful to select the best route going and coming, so as to make the most effective calls. Every salesman en route has noticed some new or rejuvenated plant he did not know was there. He has stopped in and been finally rewarded by making a chance call.

Make travel time count by mental planning en route. Use a portion of traveling time to concentrate upon the immediate prospect, picture his problems, get names straight in your mind, plan the selling tools that can be used, and determine the best strategy to employ.

The sales engineer should sharpen his mind to gather and record all necessary facts about a job on one visit. Going back to the customer, or writing or telephoning him, to get missing facts that might have been easily gathered at the time of the visit, is time-costly both for the salesman and the customer. Above all, such a practice may destroy the customer's confidence in the salesman. Thoroughness in necessary detail is the best time investment.

Home-office time can often be reduced greatly by establishing better and simpler systems and records. With shipshape files, the sales engineer can quickly reach for essential information on prospects and customers. Current correspondence, quotations, and proposals can be grasped at a second's notice. The proper sheet of descriptive literature should be immediately available, as well as engineering data sheets.

"I am terribly pinched for time," says the sales engineer. What imaginative salesman is not—with hundreds of things to do? Sales work is selective. The machine operator's duties are largely assigned, but the sales engineer is always faced with choosing the most important thing to do.

Recently I asked a first-class salesman in reference to a relatively unimportant prospect, "What are you doing to get his business?" "Nothing," he replied, "and I am proud of it." None of us should be proud of failing to call on a small prospect. But it is necessary to concentrate on those that are most worthwhile. Of course, what this salesman meant was that he had studied the importance of this call and was doing a selective selling job.

Successful sales engineers learn to manage themselves in the application of time. But now and then you encounter a salesman who is so

efficient, so impersonal, and so exact and meticulous that he fails. He cannot realize that all effort—all working time—must be colored and flavored with those golden moments, unrelated to business, that mark human interests. It may pay, in customer contact, to "waste time" now and then, but be sure it is "wasted" in the best way to get the order!

* * *

Salesmen are Bearers of Gifts

In an article entitled "Salesmen are Bearers of Gifts," published in the *Hoover Sphere*, C. W. Lighthall, president and general manager of the Hoover Ball & Bearing Co., took issue with an executive who had complained of wasting hours every week listening to salesmen. Mr. Lighthall had this to say, on behalf of the salesman: "I consider the time spent listening to salesmen is time well invested. Salesmen are living channels through which the experience, skill, and background of America's leading industries are made available to us. From them we learn about new products, new methods, new techniques. Modern salesmen are not mere peddlers or funny story tellers. Many of them are experienced engineers fully capable of answering our most technical questions about their products or services. Their expert counsel on the application of their products to the solution of our problems is often invaluable.

"Although they are not on our payrolls, the salesmen who call on us may actually be put to work for us. They come bearing gifts of ideas that will help us improve our products, cut costs, speed production. Obviously, we cannot always use what they have to offer, but we cannot afford to close our doors and our minds to what they have to tell us."

* * *

Losses Due to Work Stoppages

Automotive industry employes have lost over $500,000,000 in wages since the war because of strikes or lay-offs resulting from strikes in other plants. In one automotive plant, each idle day costs the company $1,000,000 for plant maintenance and other expenses.

* * *

Two-thirds of all the platinum metal sold to consuming industries in the United States during 1948 was used for electrical, chemical, dental, and miscellaneous purposes of an industrial nature.

Welding mower blades of high-carbon steel to disks of mild steel by the use of low-hydrogen type electrode

Using Low-Hydrogen Electrode in Assembling Lawnmower Blades

One of the operations involved in the production of large-size lawnmowers at the plant of the Worthington Mower Co., Stroudsburg, Pa., is the welding of high-carbon steel blades to disks of mild steel. For this operation, an Airco No. 394 hydrogen type electrode is employed. This electrode can be used on either alternating or direct current, and provides welds having a tensile strength up to 100,000 pounds per square inch. It is claimed that, by the use of this electrode, rejections due to weld cracking have been reduced 50 to 60 per cent. In addition, the rate of welding is higher than with the type of electrode previously employed.

* * *

While automatic transmissions for automobiles are considered comparatively recent, automotive firms were working on the development of such transmissions as early as 1904. Over 12,000 patents have been issued in the United States for such mechanisms, of which 4000 are still in force. Most of the ideas proved unworkable or too costly and complex.

Shop Equipment News

Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market

LeBlond Combination Sliding-Bed Gap and Hollow-Spindle Lathe

The R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio, has just brought out a lathe of unusual versatility and machining capacity. The new lathe is essentially a combination of two of the company's regular models—the 25-50-inch sliding-bed gap model and the 27-inch hollow spindle model. It actually serves the purpose of three different types of lathes—the sliding-bed gap model, the hollow-spindle type, and the standard heavy-duty type of engine lathe.

A totally enclosed automatically lubricated quick-change gear-box is one of many improvements incorporated in this machine, which also has a geared headstock with heat-treated steel gears. The carriage permits work to be faced up to the full swing capacity of the gap. The steel ways at the front and rear of the upper bed are hardened and ground. Chucks with large bores can be fitted to both ends of the hollow spindle, and faceplates can be mounted on the flange type spindle nose. Detachable levers are provided to facilitate moving the tailstock and the upper bed. Standard accessories and attachments are also available for broadening still further the production range and capacity of the lathe.

The bed of the new model is built in two sections, the top bed being movable on the lower one by means of a heavy coarse-pitch screw. A vee on the lower bed keeps both beds in positive alignment, and two heavy clamps hold them firmly in position. Thus the upper bed can be adjusted to any width of gap within the capacity of the machine. The special apron and carriage employed on this sliding-bed gap type lathe makes it possible to machine work of any diameter up to the full swing capacity of the gap. Other units or parts of the machine are similar to those employed on the standard heavy-duty lathes built by the company.

The large hole through the spindle of this lathe makes it possible to handle such work as long, bulky oil drilling equipment. The hollow-spindle headstock represents an important development in the design of this machine, the driving mechanism of the lathe being built around the hollow spindle. All other important parts of the lathe are similar in construction and operation to those on the company's standard heavy-duty engine lathes.

The swing over the bed and carriage wheels is 33 1/2 inches; swing over gap, 60 1/2 inches; distance between centers with gap closed, 8 feet; distance between centers with bed extended, 13 feet; spindle hole size, 12 1/2

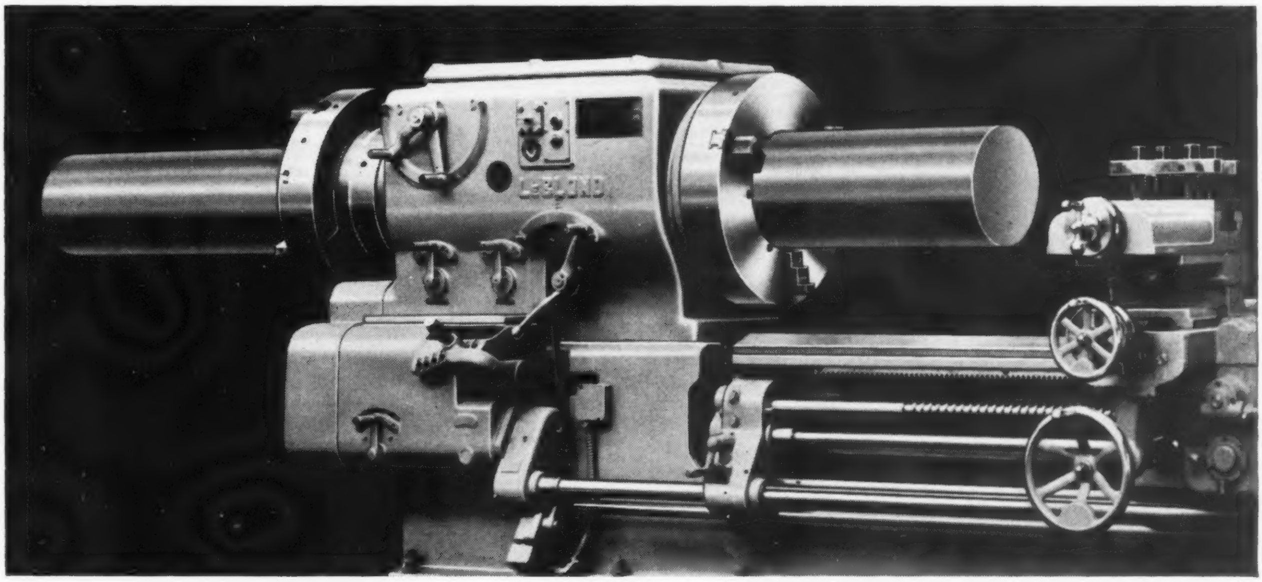


Fig. 1. LeBlond combination sliding-bed gap, hollow-spindle lathe with chucks fitted to both ends of the hollow spindle to permit handling heavy work

To obtain additional information on equipment described on this page, see lower part of page 216.

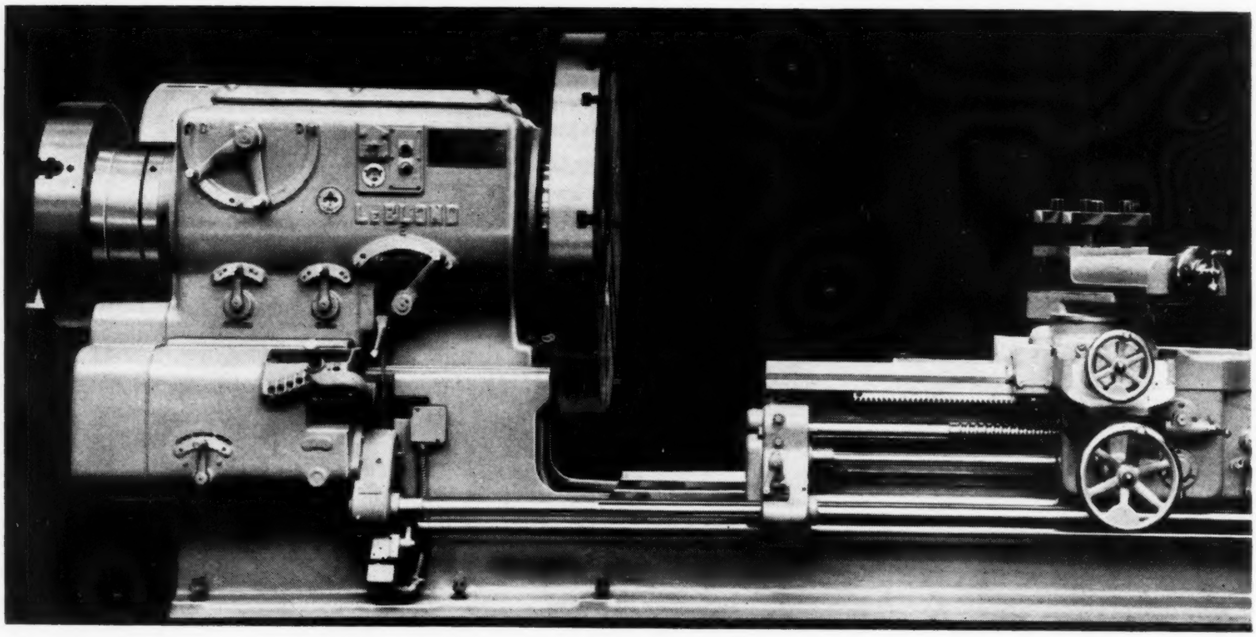
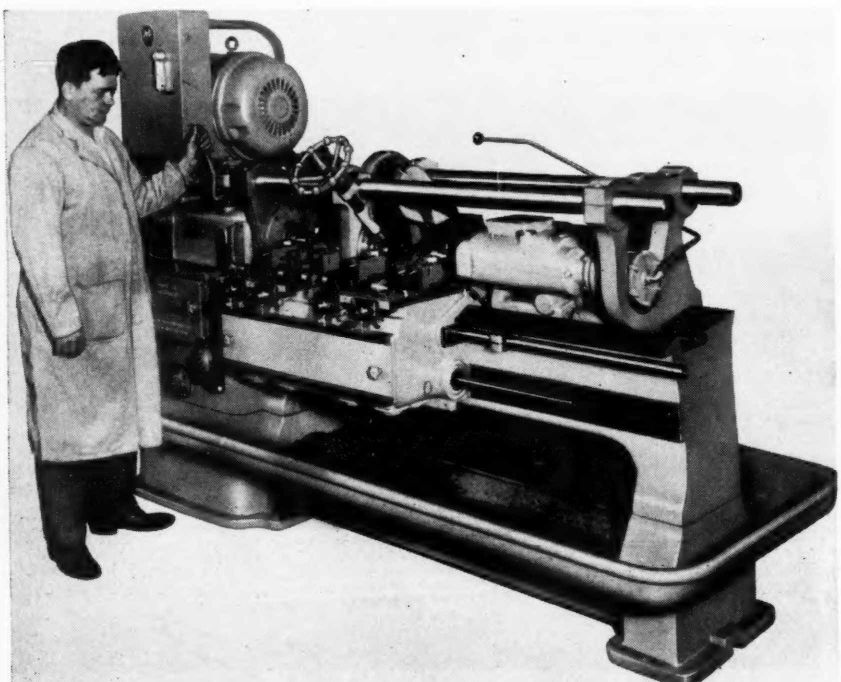


Fig. 2. LeBlond combination sliding-bed gap, hollow-spindle lathe shown with upper bed extended to provide gap for handling large-diameter work

inches; number of spindle speeds, 12; standard range of spindle speeds, 5 to 213 R.P.M.; range of spindle speeds with two-speed motor, 2 1/2 to 213 R.P.M.; and recommended size of motor, 25-12 1/2 H.P. running at 1200 or 600 R.P.M. 61

Lo-Swing Lathe Equipped for Automatically Turning Camshafts in Single Operation

The Seneca Falls Machine Co., Seneca Falls, N. Y., has just announced a Model LR Lo-swing automatic lathe designed to turn and chamfer the bearings and oil-pump gears and cut the interrupted oil-grooves in camshafts in a single operation. This center-drive lathe has a special two-jaw scroll chuck which clamps and drives the shaft from the cam located adjacent to the No. 3 bearing. The chuck jaws are opened and closed by a handwheel.



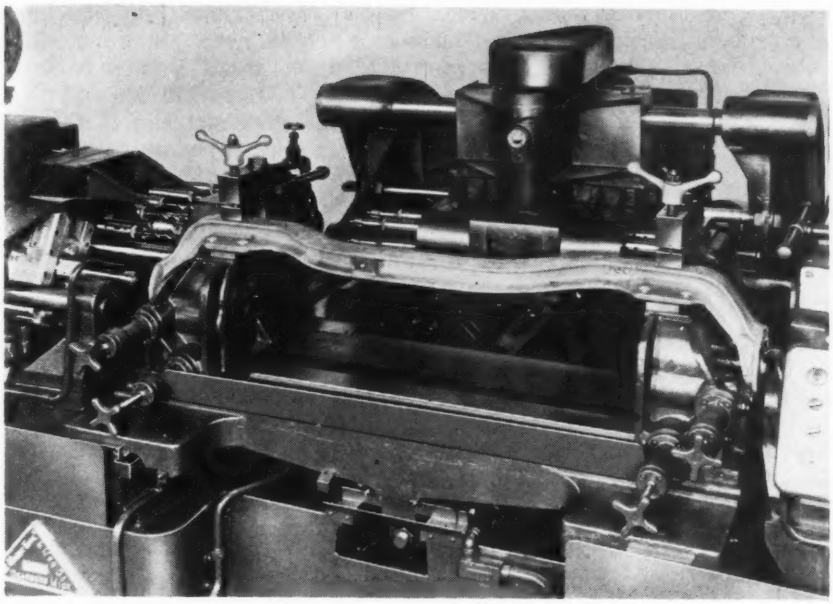
Lo-swing center-drive lathe equipped for automatically turning camshafts

The swivel type tailstock is actuated by two air cylinders. One cylinder swings the hinged upper section vertically to permit easy loading and unloading in a line parallel with the centers, thus eliminating overhang of the tailstock center, while the second cylinder controls the movement of the spindle quill. Both movements are controlled by a four-way valve.

The oil-grooving attachment is driven and timed from the main drive-shaft and imparts a shuttle motion to the grooving tool-slide which is mounted with the other squaring tools in a block on the rear slide. The driving head swivels on the chuck-drive housing and follows the "feed in" and "feed out" movement of the rear slide. The oil-grooves are cut in a definite relation to the chucked cam on the camshaft.

All movements of the lathe are automatically controlled, the operator simply loading and unloading the parts and moving the starting lever. Production is eighty camshafts per hour, with the machine operating at an efficiency of 80 per cent. 62

To obtain additional information on equipment described on this page, see lower part of page 216.



Special machine for boring, facing, drilling, and reaming automotive axles

LeMaire Two-Way Axle Boring, Facing, and Drilling Machine

The LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich., has brought out a special two-way forty-two-spindle horizontal machine with shuttle fixture for use in the production of a new type of rear axle for an underslung model truck.

The operations performed on this machine include rough- and finish-boring of the large hole, facing the ends, drilling and reaming the bolt-holes from the outside, and spot-facing the bolt-holes from the inside of the axle. The machine consists of a fabricated steel center base with two side bases, each of which supports two No. 5000 twin ram units. The center base carries a three-station shuttle type fixture and special rear drilling unit for spot-facing holes from the inside of the axle ends. 63

Planetary Thread-Rolling Machine

The Batchelder Engineering Co., 10 Park St., Springfield, Vt., has developed a new planetary "Hyper-Production" thread-rolling machine having a production capacity of 750 headed machine or cap screws of normal hardness per minute or 375 preheat-treated screws. This machine, known as the Beco Model 312, uses one externally threaded continuously rotating cylindrical inner die and three internally threaded stationary external segment dies.

Three independent automatic feeds deliver blanks to the outer dies. Blanks having three different types of heads can be rolled simultaneously and dropped into separate work baskets to prevent mixing. Three fingers feed the three blanks to the starting ends of the outer dies; then, when the screws have rolled, in planetary fashion, about half the length of the outer dies, three succeeding blanks are introduced. When the first set of screws reaches the ends of the outer dies, a third set of screws is started. Thus six screws are in the process of being rolled simultaneously. When rolling preheat-treated stock, however, a single-lobe cam is substituted for the double-lobe cam used in rolling stock of normal hardness,

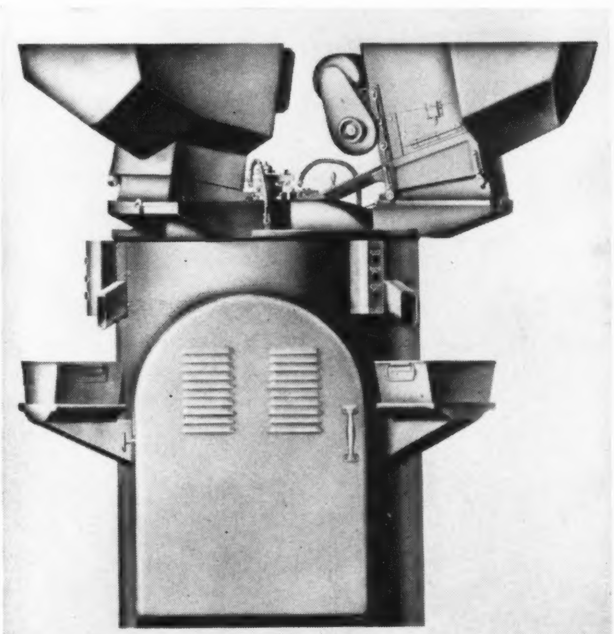


Fig. 1. "Hyper-Production" thread-rolling machine brought out by Batchelder Engineering Co.

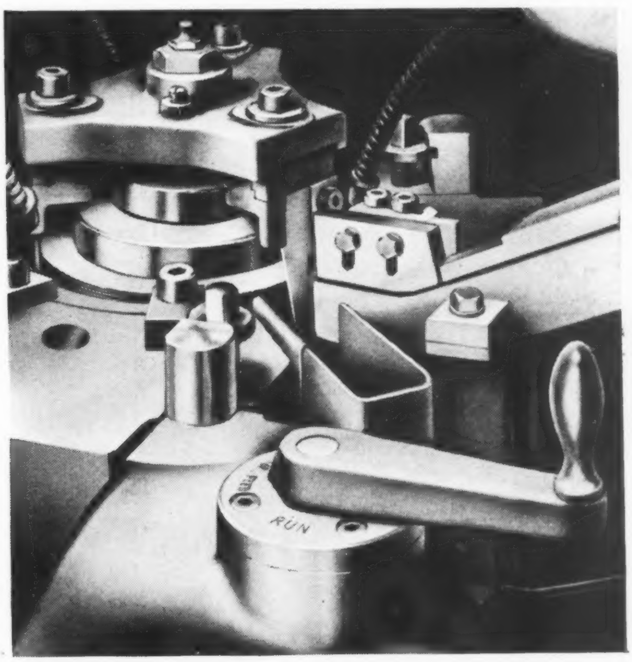


Fig. 2. Close-up view of thread-rolling head which is equipped with automatic hopper feeds

To obtain additional information on equipment described on this page, see lower part of page 216.

and the blanks are started only half as often.

Setting up has been simplified, so that it requires only a few minutes. Since the outer dies are identical, matching the inner die with one of the outer dies serves to automatically line up the other two dies.

One or two of the outer dies can be replaced if damaged without replacing the entire set. Any inner die with correct pitch and lead can be used with any outer die of corresponding characteristics. Change-over from one pitch to another can be accomplished in twenty minutes or less.

Each feed is provided with a separate 1/4-H.P. motor and starter. A 30-H.P. motor drives the spindle through a belt. The lubrication system is entirely independent of the coolant system, and the transmission is protected from the entrance of coolant or chips.

The work-handling range is from No. 4-48 to and including 5/16-inch-18 headed machine or cap screws with maximum shank length and maximum thread length of 3 inches each. Threads of Class 3 accuracy with a lead error of less than 0.0002 inch per inch can be rolled on this machine. The base of the machine is 42 by 35 inches, and the over-all diameter 77 1/2 inches. The machine weighs 3800 pounds. 64

"Channel Flushing" Induction Melting Furnace

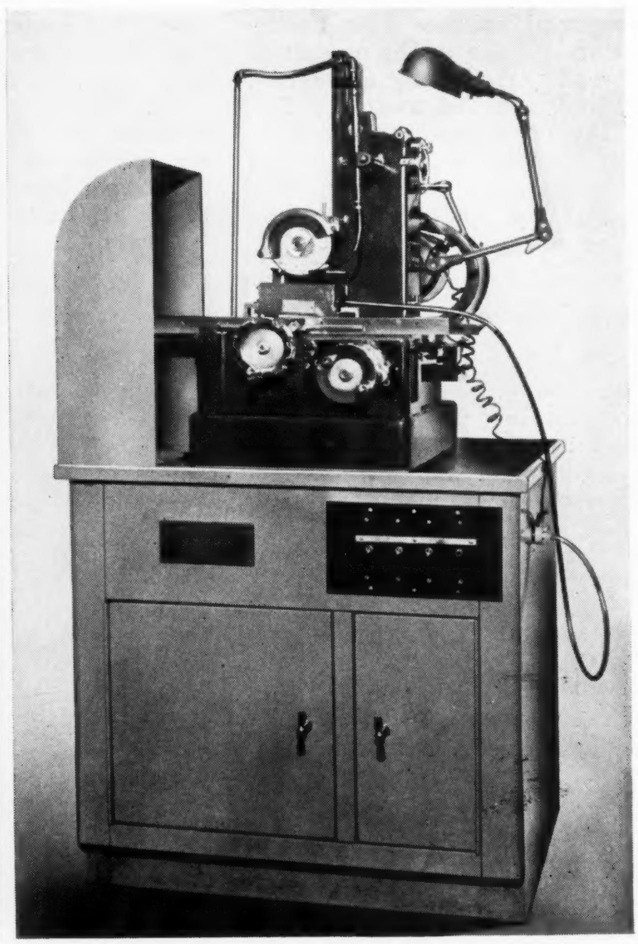
A "channel flushing" induction melting furnace has been announced by the Fisher Furnace Division of the Lindberg Engineering Co., 2444 W. Hubbard St., Chicago 12, Ill. This furnace is a development of the Lindberg-Fisher two-chamber induction melting furnace. The channel flushing feature of the new furnace is designed to keep the channels between the two chambers clean and free from slag or oxide accumulations.

The primary coil of the furnace transformer is so located that it causes a greater volume of molten metal to be impelled into one chamber than the other. This raises the molten metal level in one chamber and lowers it in the other. Every sixty seconds, when the power is cut off, the higher level subsides and the molten metal flows to the other chamber until the same level exists in both chambers. The constant flushing, stirring, and mixing action thus obtained insures that the metal will be of uniform analysis. 65

Jakobsen Precision Surface Grinder

A sensitive surface grinder designed especially for use in toolmaking and for grinding small parts has been developed by the Jakobsen Tool Co., 225 Glenwood Ave., Bloomfield, N. J. This grinder is said to be sufficiently sensitive to permit work to be held within limits of less than

Lindberg "channel flushing" induction melting furnace



Precision surface grinder developed by Jakobsen Tool Co.

To obtain additional information on equipment described on this page, see lower part of page 216.

0.0001 inch, and yet is so rigidly constructed that it can be used for heavy, rough grinding work.

Variable wheel speeds and provision for using wheels ranging from 1/16 inch to 5 inches in diameter adapt it for a wide range of grinding operations. The coolant system is designed to permit the coolant to be directed on the work at almost any angle. Parts subjected to wear are made of hardened and ground high-carbon, high-chrome steel, and are protected by dustproof and waterproof guards. 66

Chambersburg Drop-Hammer with New Ram-Holding Clamp

The Chambersburg Engineering Co., Chambersburg, Pa., is now equipping its "Ceco-Drop" gravity hammers, like the one shown in Fig. 1, with an ingenious rod clamp of the design illustrated in Fig. 2. These presses are designed to raise the ram and die by means of a piston and rod operated by a steam or air cylinder. At the top of the stroke the air or steam is exhausted and the ram and die drop by gravity.

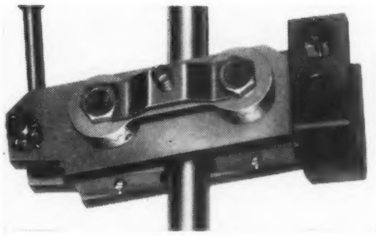


Fig. 2. Ingenious rod clamp developed for use on "Ceco-Drop" hammers

The new rod clamp, which consists of two steel blocks supported in a suitable frame, is normally held in a horizontal position by an air valve to permit the drop-hammer rod to move freely up and down between the surfaces of the clamping blocks. When it is desired to hold the ram at the top of the stroke or at any point on the down stroke, the clamp drops to the position shown in Fig. 2 and the clamping blocks grip the rod instantly, halting all movement. The rod can be released by lifting the clamp to the horizontal position. Replaceable shoes form the wearing surfaces between the clamping blocks and rod and an eccentric pivot action is provided for taking up the normal wear.......67

H-P-M Giant Size Fastraverse Sheet-Metal Drawing Press

The Hydraulic Press Mfg. Co., 1042 Marion Road, Mount Gilead, Ohio, has just announced a giant size Fastraverse sheet-metal drawing press of 1000-500-ton pressure capacity designed to handle deep-draw work of exceptionally large dimensions. This machine has a platen 120 by 72 inches, with a 70-inch daylight opening and a

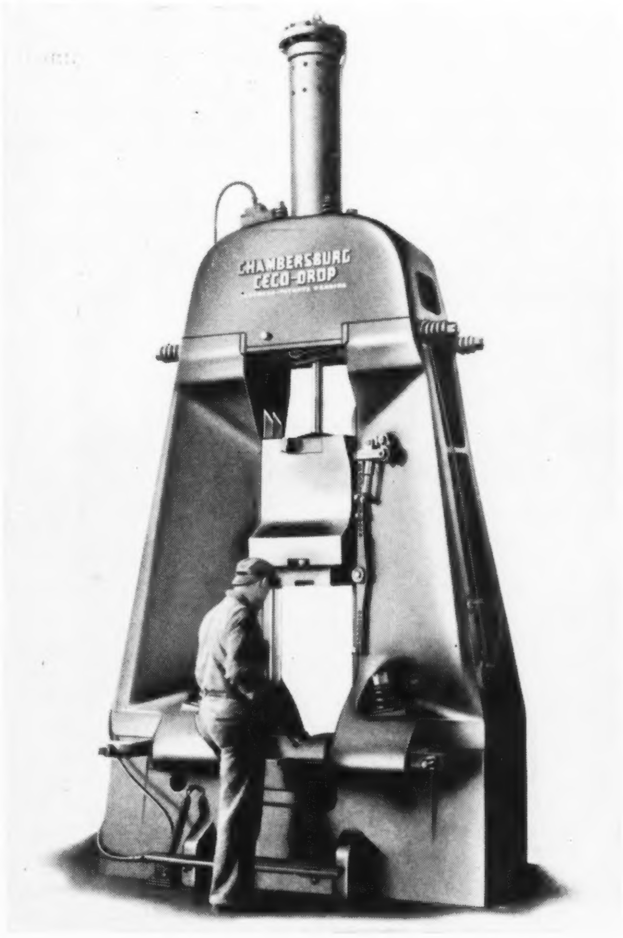
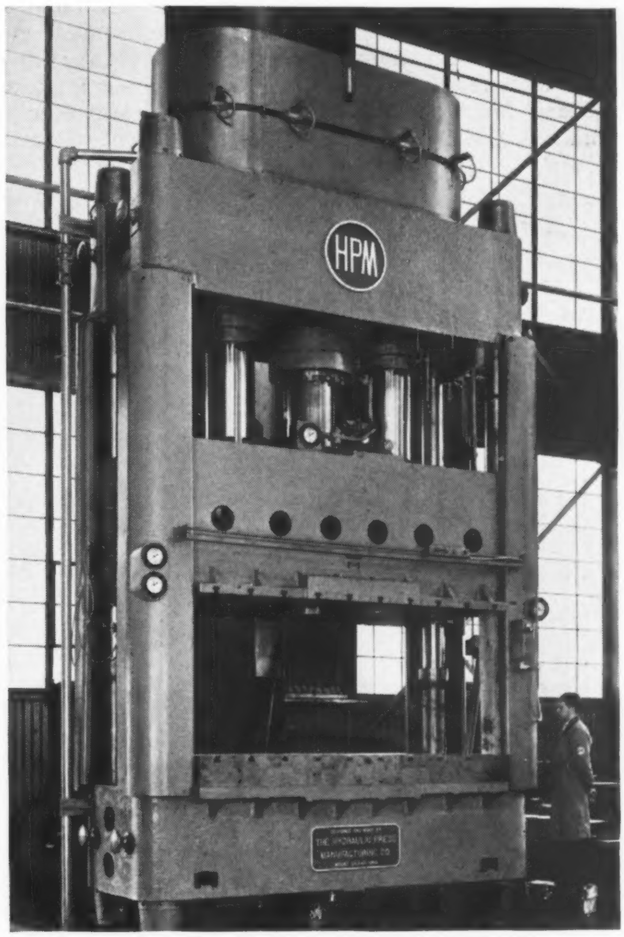


Fig. 1. "Ceco-Drop" gravity hammer built by the Chambersburg Engineering Co.



Huge Fastraverse drawing press built by the Hydraulic Press Mfg. Co.

To obtain additional information on equipment described on this page, see lower part of page 216.

36-inch ram travel. It is equipped with a 300-ton H-P-M hydraulic die cushion having a platen 48 by 52 inches and a 24-inch stroke. The bolster plate is removable.

The press is provided with three main rams for multiple-operation in two ranges of pressing speed. For a fast preliminary pressing, either the central main ram or the two outer rams can be employed with a 500-ton pressure. At a predetermined position, all three rams can be used to develop the high pressure required for final forming.

The closed-circuit Fastraverse system of operation regulates both the speed and direction of the ram movements through control of the output of the pressure generating radial pump. This system provides for a fast travel of the ram to the work, a slower, controlled, smooth pressing speed, and a rapid return of the ram to a neutral position. The cycle of operation is fully automatic, and is controlled by electric push-buttons at the operator's station. 68

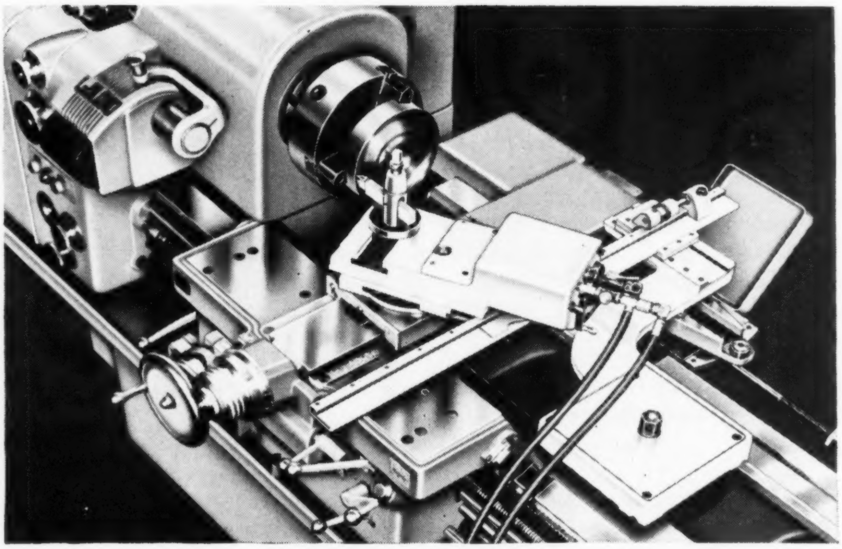


Fig. 2. "Hydra-Trace" attachment applied to lathe for profile facing

LeBlond Hydraulic Tracer Attachment Designed for Profile Turning and Facing

A new hydraulic tracer attachment designed for profile turning and facing operations has just been announced by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio. This attachment, known as the "Hydra-Trace," accommodates stock to the full swing capacity of the lathe, and does not interfere with the cross-slide travel or prevent the use of the taper attachment. It is available in six different sizes for use on the heavy-duty engine lathes, RT series engine and tool-room lathes, plain and sliding bed gap lathes, and rapid-production lathes, made by the company. The attachment can be added to new lathes or to those now in use that were built after 1935.

The Hydra-Trace attachment is mounted on a special compound rest which can be quickly interchanged with the regular com-

Fig. 1. LeBlond 16-inch lathe equipped with new "Hydra-Trace" attachment for shaft duplicating

To obtain additional information on equipment described on this page, see lower part of page 216.

pound rest. It is intended for both between-center duplicating and profile facing, the shift from one operation to the other being easily and quickly accomplished.

Since no drilling or fitting is required, the Hydra-Trace can be used on several different types of LeBlond lathes of identical size. Operating on the templet-actuated stylus principle, it adapts the standard lathe for automatic stepless contour turning and facing. It will perform the complete range of profiling operations, including straight facing and turning, tapering of any kind, shoulder turning and necking, and concave, convex, and spherical surface turning. A stylus-controlled metering device is built directly into the compound rest. Diameters are adjustable by means of the lathe cross-feed screw, and feeds are selected directly through the regular feed-box.

The Hydra-Trace consists of only five parts—the tracer slide, templet, templet carrier, bed bracket, and hydraulic tank and pump. The simplicity of design facilitates mounting and operating. Templet holder and all controls are conveniently located in front of the lathe. The T-slot on the tracer slide will take any standard or four-way tool-block, and the slide can be swiveled to suit the most favorable angle for tool clearance.

The 16-inch size tracer with 3-inch top slide travel will reduce shaft diameters from 4 1/4 to 6 inches by varying the angle setting of the tracer slide. When the tracer is used on a standard 16-inch heavy-duty engine lathe, shaft and profile facing operations can be performed on work up to 20 1/2 inches in diameter. Flat templets which can be made in any tool-room are used. 69

Improved Cutting Oil for Stainless Steel and Chrome-Nickel Alloys

An improved high-sulphur cutting oil known as Excel No. 60 has been brought out by Oil Products Co., Inc., 4109 S. La Salle St., Chicago 9, Ill. This new cutting oil has been developed to remain stable under all conditions encountered in machining stainless steels, chrome-nickel alloys, and Monel metal. It combines in one lubricant the qualities and characteristics required to obtain a superior finish and increased tool life, as well as maintain close limits of accuracy at speeds and feeds somewhat higher than those ordinarily considered standard practice. In machining 18-8 steel, for example, tools will maintain their cutting edge for eight hours before resharpening is necessary when using surface cutting speeds up to 125 feet per minute. 70

Grand Rapids Universal Cutter and Tool Grinder

Gallmeyer & Livingston Co., 305 Straight St. S.W., Grand Rapids 4, Mich., has announced a new small-size universal cutter and tool grinder designed for small shops, as well as for large manufacturing plants requiring batteries of machines of this type. This new Model 10 cabinet-base machine is built to meet the demand for a high-quality, moderately priced grinder of medium capacity, combining rigidity with maximum operating convenience.

The column and head of the machine are raised and lowered by means of a handwheel at the top of the column. The longitudinal movement of the table is obtained by operating a handwheel or lever on the front of the machine or a lever at the rear. Crosswise movement of the saddle is obtained from any desired position by means of handwheels at the front and rear of the machine. Graduated dials reading to 0.001 inch are provided for both vertical and transverse movements. The head of the machine can be swiveled through an angle of 180 degrees and can be instantly locked at any desired position. The table can be swiveled to 90 degrees either side of center to provide any desired setting with respect to the grinding wheel spindle.

The grease-sealed precision ball-bearing spindle requires no lubrication for the life of the bearings and is driven through a V-belt by a 1/2-H.P. ball-bearing motor

Grand Rapids cutter and tool grinder with universal equipment announced by the Gallmeyer & Livingston Co.

To obtain additional information on equipment described on this page, see lower part of page 216.

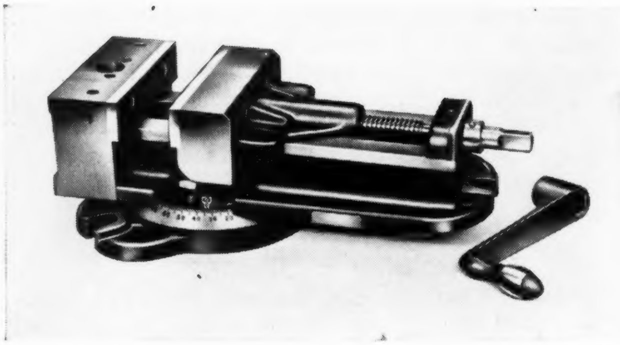


Fig. 1. Swivel-base vise brought out by the Graham Mfg. Co., Inc.

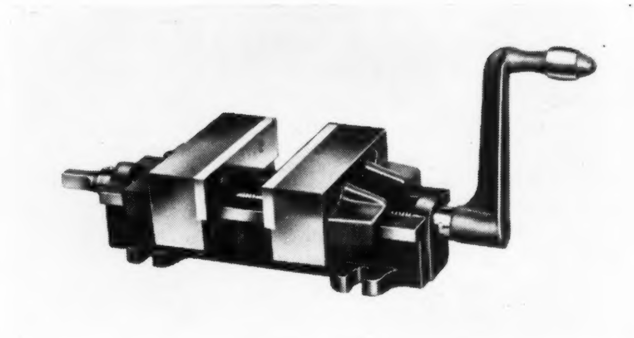


Fig. 2. Self-centering vise recently announced by Graham Mfg. Co.

mounted on the head of the machine. Two spindle speeds are provided. The table is 5 by 30 inches and has a longitudinal movement of 16 inches. Crosswise movement of the wheel is 8 inches and the vertical movement of the spindle is also 8 inches. 71

Graham Swivel-Base and Centering Vises

The Graham Mfg. Co., Inc., 29 Bridge St., East Greenwich, R. I., has brought out the new swivel-base vise illustrated in Fig. 1. Provision is made for complete 360-degree rotation with positive two-point locking. An adjustable zero pointer facilitates exact matching with the zero on the base scale. The base can be removed to permit using only the vise when desired. Drilled and tapped holes are provided for attaching jigs and special jaws. The vise takes No. 3 size attachments and jaws. The jaws are 6 inches wide, 1 1/2 inches high, and open to 4 1/2 inches. The complete vise weighs 45 pounds.

The new Graham centering vise shown in Fig. 2 has jaws 6 inches wide by 1 1/2 inches high that open to 6 1/4 inches. Both jaws move toward the center when the clamping screw is turned by the crank, which can be used at either end of the vise. This vise positions the center of the work at a desired point on the machine table, regardless of variations in the size of the part. It can be opened and closed at double the speed of conventional vises since both jaws move simultaneously. 72

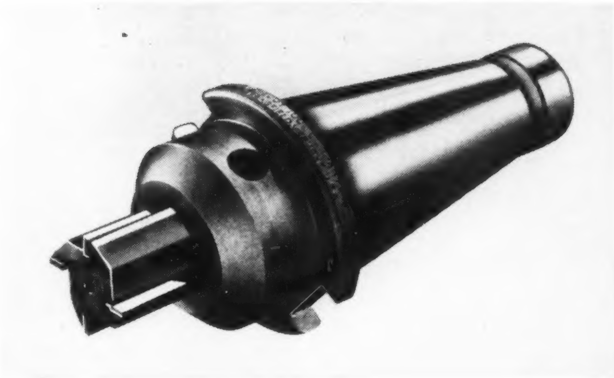
Kux die-casting machine designed especially for producing parts with inserts

Kux Vertical Die-Casting Machine for Production of Parts with Inserts

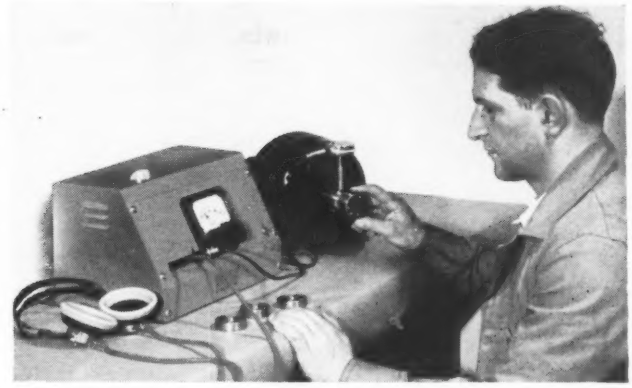
A cold-chamber die-casting machine designed especially to facilitate the production of parts having cast-in inserts has recently been added to the line of the Kux Machine Co., 3925 W. Harrison St., Chicago 24, Ill. The die-plates of this Model HP-22 machine are mounted in a horizontal position, although they operate in a vertical direction. Thus inserts can be placed in the lower die half without difficulty and will remain in place throughout the die-casting cycle.

Castings such as electric motor rotors, flywheel and magneto parts having magnet inserts, and parts with bushings that are cast in can be easily made on this machine with less expensive dies. The machine is electrically controlled and has a self-contained hydraulic operating mechanism. It is constructed with a high-pressure cold chamber and injection pressure multiplier. The die space is 17 3/4 inches square between the bars. Castings weighing up to 4 1/2 pounds in aluminum can be produced. 73

To obtain additional information on equipment described on this page, see lower part of page 216.



Carbide-tipped end-mill and holder placed on the market by the Lovejoy Tool Co., Inc.



"Sono-Probe" for detecting and analyzing vibrations made by Aircraft Electronics Associates, Inc.

Carbide-Tipped End-Mills and Holders with Positive Locking Device

The Lovejoy Tool Co., Inc., Springfield, Vt., has announced a complete line of carbide-tipped end-mills and holders in which the Lovejoy positive locking device is used to hold the mills securely in the holder, with provision for endwise adjustment and quick change of cutters. An alternate adjusting shoe is available which adapts the cutters for use on standard set-screw type holders.

Two-flute end-mills are available in diameters from 1/2 to 1 inch, and four-flute mills in diameters from 3/4 inch to 2 inches. All end-mills have 1-inch diameter shanks to assure interchangeability, and are available for cutting cast iron or steel, and various other materials.

One-flute end-mills, 1 inch in diameter, are available for use when low cost and ease of sharpening are primary considerations. Holders are available with Nos. 4, 5, 6, and 7 Morse tapers, Nos. 7, 8, and 9 B & S tapers, and Nos. 40 and 50 National Machine Tool Builders' adapters. 74

Cross Special Machine for Finishing Carburetor Manifolds

A special machine that completely finishes automobile dual-carburetor intake manifolds, except for milling, has been designed by The Cross Company, Detroit 7, Mich. Operations include drilling, reaming, and tapping. The production rate of this machine is 155 pieces per hour.

The new equipment has a five-station power index trunnion, with an independent station for loading and unloading while the machine is in operation. With this arrangement, four pieces of work are machined at a time progressively.

The use of standard Cross units in this machine provides the flexibility required for changes in product design. Other features include a fluid-drive index with overload protection for safety, hydraulic feed for drilling and reaming, lead-screw feed for tapping, and hardened and ground steel ways. 75

"Sono-Probe" Electronic Amplifier for Detecting and Analyzing Vibrations

An electronic amplifier known as the "Sono-Probe," for vibration detection and noise analysis, has been placed on the market by Aircraft Electronics Associates, Inc., 1031 New Britain Ave., Hartford 10, Conn. The instrument is equipped with a contact microphone that picks up vibrations or noises by means of a long metal probe or an alternate probe of Bakelite designed for use around electrical equipment. The

Special carburetor manifold finishing machine designed by The Cross Company

To obtain additional information on equipment described on this page, see lower part of page 216.

probe, when placed in contact with the source of vibration, such as a shaft, bearing, housing, etc., is insensitive to airborne sounds, and thus permits investigation to be confined to the object with which the probe is in contact.

Earphones enable the character of vibrations to be analyzed, a decibel meter and simple volume control providing accurate measurement of the amount of vibration. Volume can be adjusted to an acceptable standard decibel level on the meter and the vibration level of any number of similar parts measured by this standard. The bench model is designed for operation on 115-volt alternating current. 76

Covel Hydraulic Surface Grinder

A hydraulic surface grinder with an 8- by 24-inch table has been developed by the Covel Mfg. Co., Benton Harbor, Mich., to fill the need for a moderate priced, large-capacity machine of this type. The construction of this No. 35 machine makes it suitable for either production or tool-room work. It has spindle speeds of 1750, 2200, and 2600 R.P.M. Table speeds up to 90 feet per minute are provided, and the wheel is driven by a 2-H.P. motor.

The table has a longitudinal travel of 27 inches and a transverse travel of 9 inches. The grinding wheel is 12 inches in diameter, and has a vertical travel of 14 inches. Minimum distance from center of spindle to top of table is 3 inches, and maximum distance 17 inches. The machine requires a floor space of 96 by 57 1/2 inches, and weighs 3300 pounds. 77

Special Oilgear Press Built for Assembling Propeller-Blade Bushings

The Oilgear Co., 1340 W. Bruce St., Milwaukee 4, Wis., recently built the 50-ton horizontal press shown in Fig. 1 for assembling cone-shaped bushings in airplane propeller blades. The hub-end of the propeller blade is inserted through a hole in the right-hand end of the press. A cam ring rotated by an air cylinder moves four sliding blocks into place behind the flange on the blade, as shown in Fig. 2. The bushing is then placed on the ram-nose assembly, which has a pilot and automatic equalizer thrust plate. Depressing a push-button causes the guided press ram to force the blade shoulder against the slide-blocks as the bushing is pressed into place. When the pre-set pressure is reached, a switch operates the pump control, causing the ram to return to its starting position. The air cylinder then withdraws the slide-blocks to permit removal of the blade.

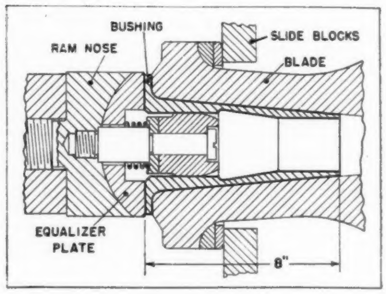


Fig. 2. Cross-section of airplane propeller-blade hub with cone-shaped bushing forced into place by press shown in Fig. 1

The press has a ram stroke of 3 inches and the distance between columns is 27 inches. It is equipped with a two-way variable-delivery pump direct-connected to a 3-H.P. electric motor. The pressing speed is variable up to 17 1/2 inches per minute and the return speed is variable up to 35 inches per minute. The weight is 5940 pounds. 78

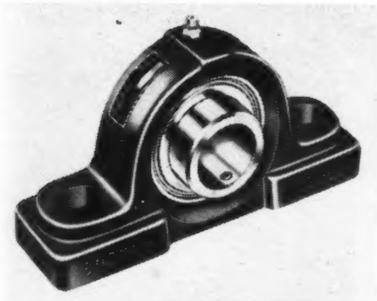
Self-Aligning Flanged-Cartridge and Pillow-Block Bearings

Quick, simple installation, self-alignment, and easy servicing are features claimed for precision ball-bearing pillow-block and flanged-cartridge type bearings

Hydraulic surface grinder built by Covel Mfg. Co.

Fig. 1. Press for assembling bushings in propeller blades

To obtain additional information on equipment described on this page, see lower part of page 216.



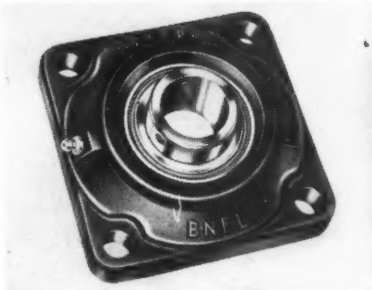


Fig. 1. (Left) Self-aligning ball-bearing pillow block made by Boston Gear Works. Fig. 2. (Right) Self-aligning precision ball-bearing flanged cartridge

just placed on the market by the Boston Gear Works, 56 Hayward St., Quincy 71, Mass. Both the pillow block, shown in Fig. 1, and the flanged-cartridge bearing, shown in Fig. 2, have spherically ground outside diameters which simplify mounting by assuring accurate alignment on the shafts.

A new oil-resistant seal of labyrinth design provides dirt-free lubrication chambers. The seal is integral with the bearing and permits unrestricted misalignment, allowing excess grease to escape without danger of blowing out the seal. The bearings are prelubricated, and can be placed directly in service, Alemite fittings being used to facilitate regreasing. Rigid mounting is provided by solid, one-piece cast-iron housings. Both the flanged-cartridge and pillow-block bearings are available for shafts from 1/2 inch to 1 1/4 inches in diameter. 79

Kentron Micro-Hardness Tester

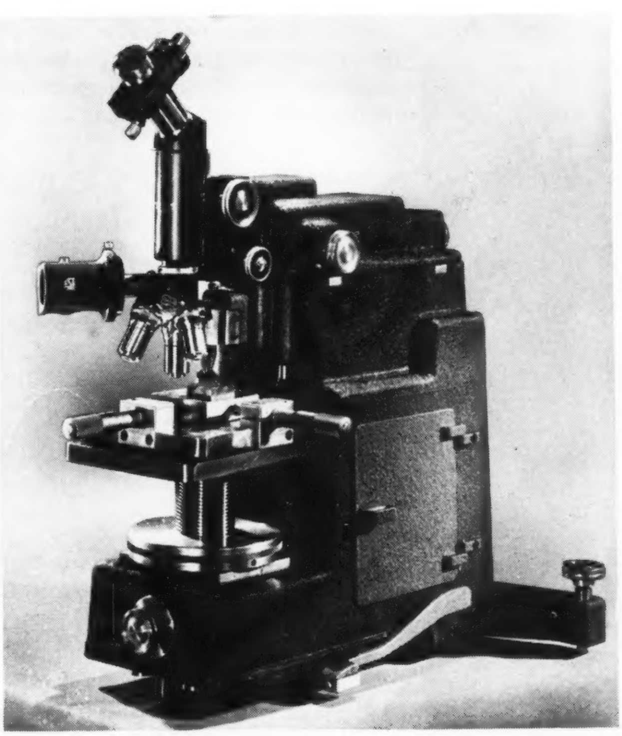
Kent Cliff Laboratories, Peekskill, N. Y., have recently brought out a Kentron micro-hardness tester, designed for accurate application of dead weight loads as light as one gram, for use with either the Knoop or Vickers type indenter. The instrument is adapted for testing micro-hardness of minute particles, inclusions, thin metals, transition zones of welds, wire, foil, glass, enamels, plastics, and jewels.

This bench type instrument is hand-operated, and is designed to eliminate instrument-operating vibration. An oil dashpot for controlling the application of load is easily adjusted to suit specific requirements. Dead weights for applying loads of 1 to 1000 grams and optical measuring equipment are supplied. 80

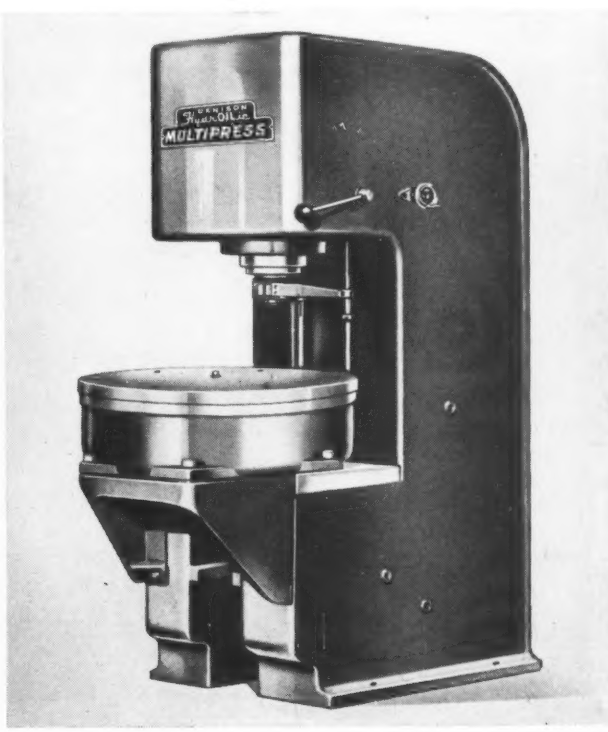
Denison Standardized Line of Oil-Hydraulic Presses

The Denison Engineering Co., 1152 Dublin Road, Columbus 16, Ohio, has announced the standardization of its Multipress line of oil-hydraulic presses designed for operations on production-run and special jobs requiring pressing capacities from 1 to 35 tons. This line now provides a flexible range of self-contained presses to suit a wide variety of industrial requirements. They are available in seven standard sizes with compact frames, each of which is designed to suit specific dimensional and tonnage requirements.

Three groups of elements, interchangeable within certain limits, that make up the major operating components include hydralic



Micro-hardness tester made by Kent Cliff Laboratories



Denison oil-hydraulic Multipress of 25 tons capacity

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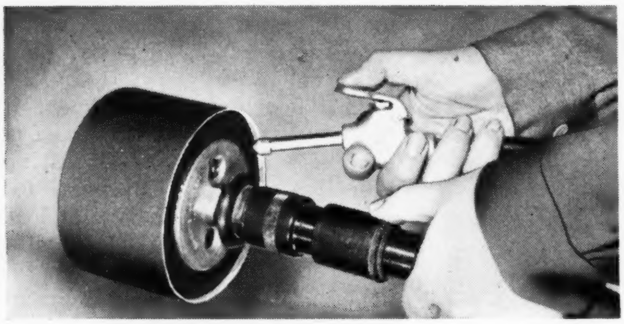
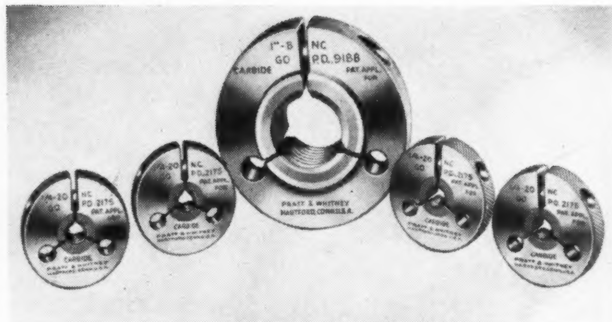


"Nu-Matic" abrasive-band inflated rubber drum grinder



Pratt & Whitney "Dualock" adjustable thread ring gages

power assemblies; cylinder and ram assemblies of several sizes; and as many as ten different types of control valves. With the broad selection of frames and operating elements available, it is possible to obtain the exact tonnages needed for individual applications; adjustable ram stroke length for maximum efficiency; ram speed required to turn out the highest number of pieces per minute at the lowest production cost; and daylight opening and throat depth sufficient to accommodate a wide range of work. 81

"Nu-Matic" Rubber Drum Grinder

A pneumatic rubber drum, inflated at low pressures to hold an abrasive band securely on its periphery, is the principal element of a new low-cost power-wheel unit developed for grinding, sanding, or polishing curved, irregular, and contour surfaces. This new unit, made by Nu-Matic Grinders, Inc., 10304 W. McNichols Road, Detroit 21, Mich., can be used on bench, portable, or flexible-shaft motors.

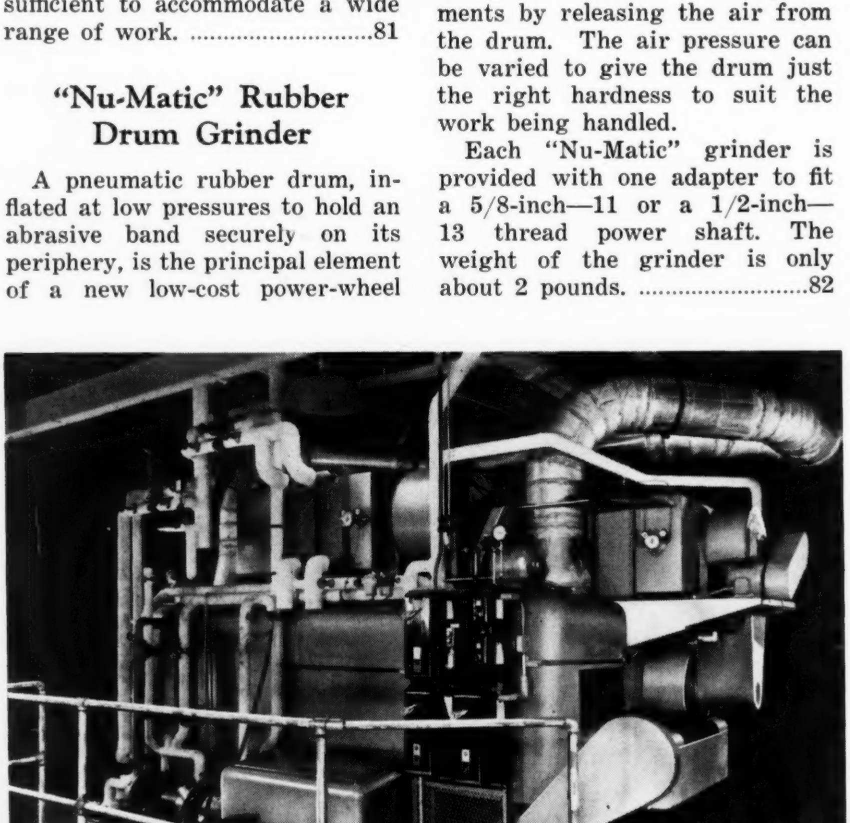
Standard abrasive bands, 5 inches in diameter by 3 1/2 inches wide, are available in 24 to 500 grit for use on this grinder drum. The abrasive bands can be quickly changed to meet work requirements by releasing the air from the drum. The air pressure can be varied to give the drum just the right hardness to suit the work being handled.

Each "Nu-Matic" grinder is provided with one adapter to fit a 5/8-inch—11 or a 1/2-inch—13 thread power shaft. The weight of the grinder is only about 2 pounds. 82

Carbide Adjustable Thread Ring Gages

"Go" and "Not Go" carbide "Dualock" adjustable thread ring gages have been brought out by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. These gages have been developed to eliminate the hazards of gage wear on close-tolerance work and for use on long production runs where accuracy must be maintained. They are also adapted for use as master gages, since they have the long wearing qualities and stability required.

The new gages are adjustable, having the same locking mechanism as steel ring gages. They are relieved at the major diameter to preclude the possibility of interference and to assure the required contact on the thread flanks; are convoluted on both ends to remove partial threads up to the start of the full thread; and are precision-lapped to eliminate grinding marks and irregularities. 83



Cincinnati drum and belt type washing machine designed for small parts

Cincinnati Drum and Belt Type Washing Machine

A combination drum and belt type washing machine designed for cleaning miscellaneous parts, as well as the tote boxes used to carry the parts, has been brought out by the Cincinnati Cleaning & Finishing Machinery Co., Hecla St., Ironton, Ohio. Parts dumped in the hopper or loaded on the belt at one end of this machine are cleaned and discharged at the opposite end. Tote boxes turned upside down on the belt are also washed and discharged at the same time. Extra equipment can be provided for this machine which will return the tote boxes to the loading point to facilitate one-man operation. 84

To obtain additional information on equipment described on this page, see lower part of page 216.

Delta-Milwaukee "Dual-Weld" combination welding machine

Combination Spot- and Arc-Welders

The Delta Mfg. Division, Rockwell Mfg. Co., 600 E. Vienna Ave., Milwaukee 1, Wis., has recently placed on the market three new welders—a "Dual-Weld" combination spot- and arc-welder; a 5-KVA spot-welder; and a portable 120-ampere arc-welder.

The new "Dual-Weld" combination welder illustrated requires less than half the floor space needed by the average 5-KVA spot-welder and 120-ampere arc-welder. It is but 14 inches wide, 19 3/4 inches high, and 26 5/8 inches long. This welder is especially suitable for use in maintenance and repair departments, research departments, and in radio, electric, and other light-metal fabrication industries. It can be employed for spot-welding, arc-welding, soldering, and brazing, the 10-inch throat depth enabling spot-welding to be accomplished at the center of a 20-inch sheet. A hand-lever permits quick change-over from arc- to spot-welding.

The 5-KVA spot-welder is designed for use in manufacturing plants, light fabrication industries, and sheet-metal shops. This welder delivers a maximum of 7000 amperes and operates on 230-volt, single-phase, 50- to 60-cycle alternating current and can also be operated on a reduced voltage, 115-volt current, which makes possible the welding of extremely fine wires without overheating or burning. It can be converted to a fully automatic production spot-welder by adding air equipment and a weld timer.

The 120-ampere transformer type portable arc-welder is adapted for many uses in repair shops, machine shops, and salvage departments. Its speedy voltage recovery provides a steady arc. Provision is made for stepless adjustment of the current between 30 and 120 amperes for arc-welding, brazing, and soldering. Electrodes from 1/16 to 1/8 inch in diameter are recommended for use with this welder. 85

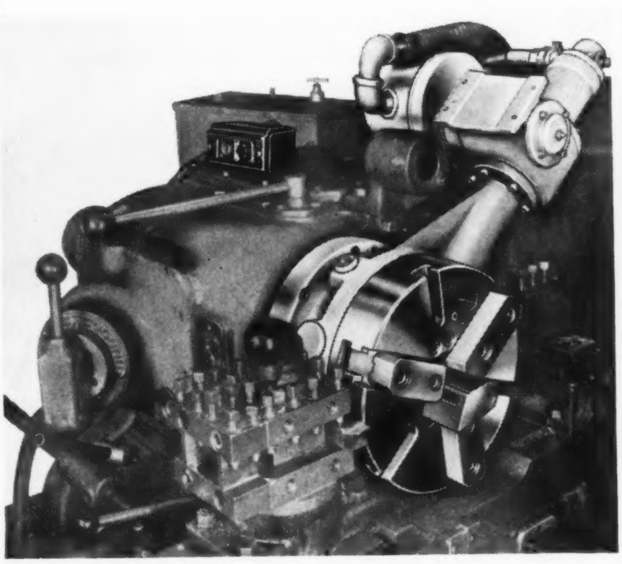
"Air-O-Torque" Quick-Acting Chuck with Center Hole

A heavy-duty power chuck designed to combine the advantages of an air-operated chuck with those of a power-wrench-operated chuck has been announced by the Whiton Machine Co., New London, Conn. This new "Air-O-Torque" chuck has a center hole which permits through feeding of stock, and an air control lever that enables the operator to instantly open or close the jaws while the chuck is in any position.

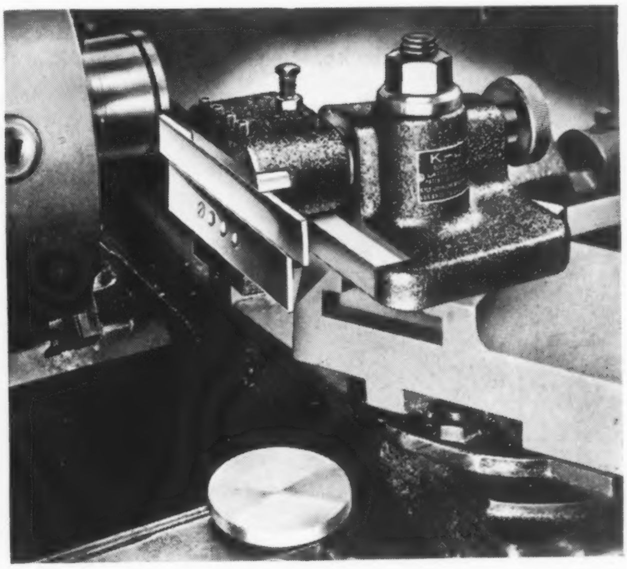
The chuck housing is fastened directly to the lathe head. The lathe spindle extends through the housing and is attached to the chuck. Thus the housing remains stationary while the chuck is free to move with the spindle. Operation is similar to that of a regular gear scroll chuck, except that an air motor drives the pinion that engages the scroll for opening and closing the jaws. The gripping pressure can be controlled by adjusting a valve. Positive braking can be provided to hold the chuck stationary. 86

Cut-Off Tool for Engine Lathe

The BiggStava Co., 3357 Union Pacific Ave., Los Angeles 23, Calif., has added a new type of cut-off tool holder to its line of K-J quick-change tool-holders for



"Air-O-Torque" air-operated chuck with center hole to permit through feeding of stock



Cut-off tool and holder brought out by the BiggStava Co., for use on engine lathes

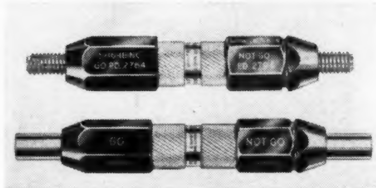
To obtain additional information on equipment described on this page, see lower part of page 216.

engine lathes. The cut-off tool rests on a supporting blade which is made slightly concave along the top edge to fit the convex surface on the lower edge of the tool. It is claimed that the solid support provided for the cut-off blade by this holder eliminates chatter and tool breakage.

The holder accommodates any standard ground or unground cut-off blade. The tool will cut off 7-inch bar stock, and is one of a line of thirteen standard quick-change tool bit holders made in five sizes for lathes with swings from 9 to 72 inches. 87

Pratt & Whitney Reversible Plug Gages

A new line of reversible plug gages developed to reduce gaging costs has been announced by the Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn. When a cylindrical or threaded gage member is worn below size, it can be quickly reversed in its holder so that the opposite, unused end is in position ready to continue the gaging operations.

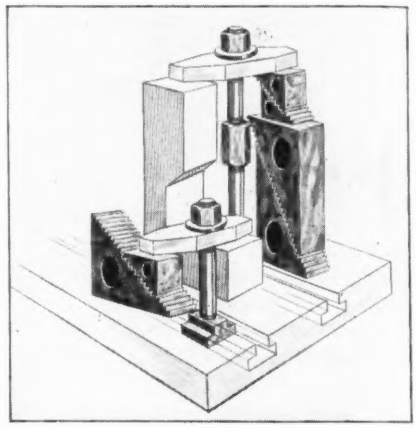


P & W thread and cylindrical gages with reversible plug members

These gages are regularly furnished with cylindrical or thread plugs, the cylindrical members being made to American Gage Design Standards in sizes from 0.030 to 0.510 inch in steel, chromium plate, and carbide, while the threaded gage members are furnished to X tolerances for checking National Coarse and National Fine threads in sizes from 0 to 1/2 inch. 88

Northwestern Flanged Nuts, Stud Sets, and Step Blocks

The Northwestern Tool & Engineering Co., 117 Hollier Ave., Dayton 3, Ohio, is introducing at the Fourth Southern Machinery and Metal Exposition, to be held in Atlanta in April, a complete range of flanged nuts in sizes from 5/16 to 1 inch. These heavy-duty nuts are designed to eliminate the use of loose washers in making machine set-ups. They are produced from the solid metal and heat-treated to resist wear.



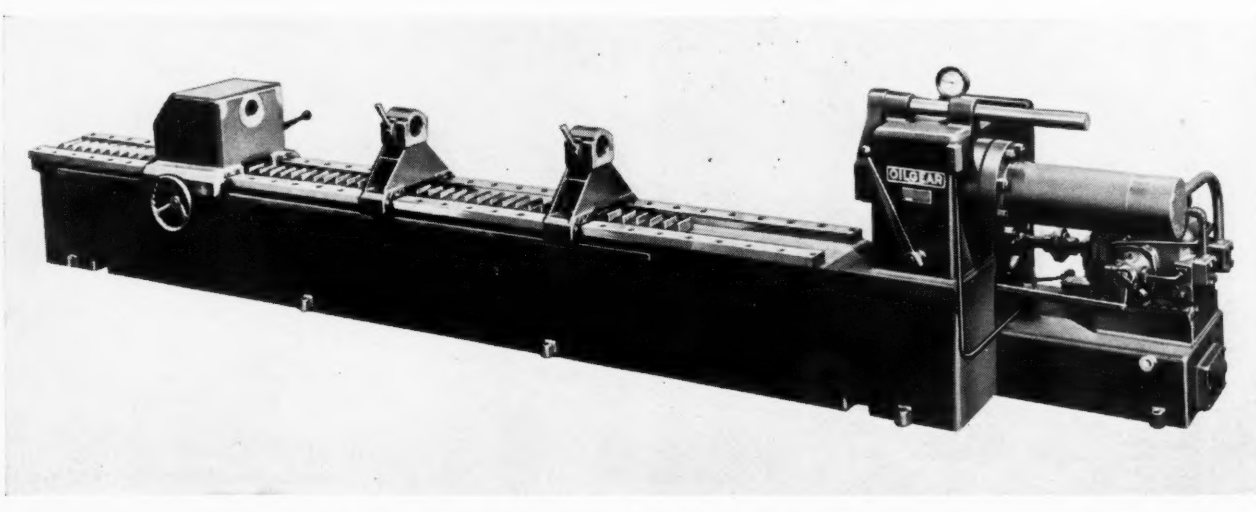
Step-block sets for machining set-ups announced by Northwestern Tool & Engineering Co.

Step-block sets with a step block 50 per cent larger than any previously made and graduated in 1/16-inch steps will also be exhibited. These blocks are 2 inches thick, have a range from 3 1/2 to 9 inches, and can be had in cyanided steel or maple wood. 90

Oilgear Horizontal Assembling Press

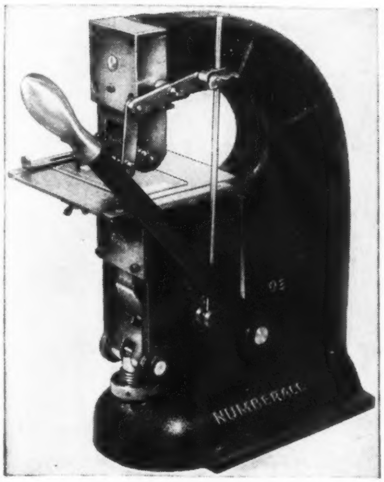
A special 35-ton assembling press, having an adjustable tailstock capable of resisting the full tonnage capacity, is being made by the Oilgear Co., 1340 W. Bruce St., Milwaukee 4, Wis. This press is adaptable for assembling a variety of propeller stub shafts in tubes. Daylight adjustment has a range of from 30 to 180 inches in increments of 3 inches. The tailstock is moved on hardened and ground ways by means of a handwheel, pinion, and stationary rack. It is locked to the ways with screws and gibs, the locking pawl being lever-operated.

Two split steadyrests provided with locking levers can be adjusted to any spacing and clamped to the ways. The ram has an auxiliary guiding arm and rod and the hand-lever control is spring centered. A Type DH-2017 two-way variable-delivery pump is direct-connected to a 15-H.P. electric motor. Similar presses are used to assemble right- and left-hand rear-axle tubes to differential housings...89



Horizontal assembling press brought out by the Oilgear Co.

To obtain additional information on equipment described on this page, see lower part of page 216.



Numbering, Marking, and Stamping Press

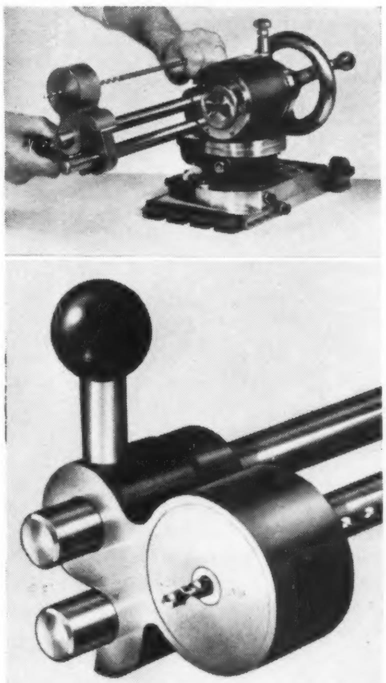
The Numberall Stamp & Tool Co., Huguenot Park, Staten Island 12, N. Y., has recently brought out a Model 93 bench type hand-operated toggle press designed for use with its automatic Model 50 numbering head for consecutive numbering operations. The press will exert pressures up to 10 tons, and has an adjustable head space. 91

"Revodex" Direct-Reading Dial

Direct-reading dial developed for use on small and medium-sized lathes, milling machines, and other machine tools. Suitable for all equipment employing screw-feed travel where accurate cutting tool adjustments or precise table movements are essential. Announced recently by Van Dyke Instruments, Inc., 1401 Airway Drive, Glendale 1, Calif., with sales office at 952 S. Crenshaw Blvd., Los Angeles 6, Calif. "Revodex" dial consists of two intergeared dials. The first dial is graduated in thousandths of an inch, the second dial is graduated in tenths of an inch and indicates the actual number of revolutions of the first dial. 92

Attachment for Radially Relieving Long Tools

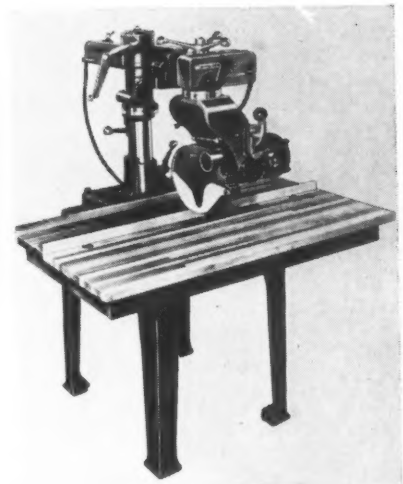
New attachment for the D-S grinding fixture manufactured by the Royal Oak Tool & Machine Co., 621 E. 4th St., Royal Oak, Mich., that makes possible radial relief grinding of long tools not equipped with centers. Can be mounted on bars provided as a standard part of the fixture, as shown in the upper view, and supports the tool close to its end for grinding, as indicated in the lower view. Attachment can be swiveled on top bar, so that tools with large shanks can be inserted from the rear, and there is no need of changing the position of the fixture when the same form is being



ground on more than one tool. Standard drill bushings and liners can be inserted for any size tool up to 1 3/8 inches in diameter. 93

Walker-Turner Radial Saw

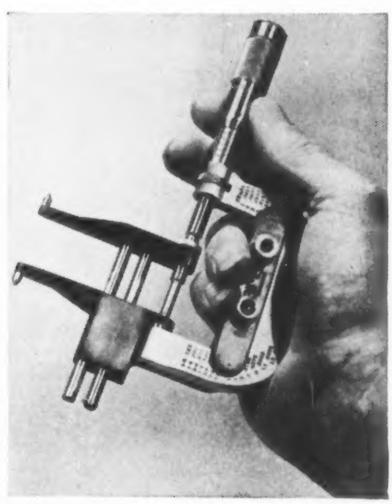
New 900 series radial saw manufactured by the Walker-Turner Division, Kearney & Trecker Corporation, Plainfield, N. J. Features developed to make cutting easier and faster on all plastic, wood, and similar materials include: New center-pivot offset yoke which permits all cuts to be made in the convenient table area; 3 1/8-inch capacity with 9-inch blade; new cool-running geared motor with two and a half times overload capacity; 24-inch cross-cut travel; capacity for ripping to center of 48-inch panel; rigid, accurate holding design which incorporates taper latch indexing and locks that are easy to reach and operate; and table of lam-



inated hard maple 46 by 24 inches. Available with either single- or three-phase 1 1/2-H.P. motor. 94

"Microdapter" that Facilitates Internal Measuring with Outside Micrometers

Improved model "Microdapter" attachment designed to adapt outside micrometers for inside measuring. Recently announced by the Rimat Machine Tool Co., 1117 Air Way, Glendale, Calif. Cone-shaped measuring points project beyond each leg of attachment and readily enter internal grooves and recesses in deep bores. The attachment can be instantly and securely clamped to any micrometer frame. Measurements are read directly on regular thimble with original micrometer accuracy. When measuring grooves behind shoulders and similar work having restricted openings, the legs are simply compressed manually and withdrawn. Available in stock sizes for 1-inch micrometers, covering a range of 1/2 to 1 inch; for 2-inch micrometers, covering a range of 1 to 2 inches; and for 3-inch micrometers, covering a range of 2 to 3 inches. 95



To obtain additional information on equipment described on this page, see lower part of page 216.

Columbian Hydraulic Vise

New foot-operated oil-hydraulic swivel type machinist's vise with 3 1/2-inch wide jows that have a maximum opening of 6 inches. Foot operation leaves both hands free for handling and positioning the work between the vise jaws, thus facilitating the assembling of two or more pieces by welding, soldering, or other methods. When the jaws have been closed, maximum pressure for gripping and holding work can be developed by two additional strokes of the power pedal, which provides pressures up to 6000 pounds per square inch. The vise is protected by a safety relief valve to prevent overloading of the hydraulic system and the vise itself. Announced by the Columbian Vise & Mfg. Co., 9017 Bessemer Ave., Cleveland 4, Ohio. 96

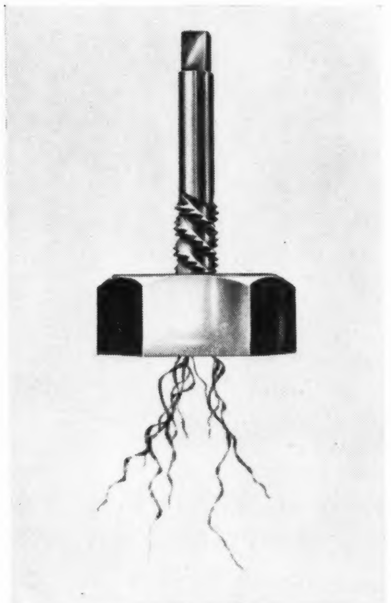
Ross Valve for Controlling Coolant

Straight-way or shut-off valve of normally open or closed type developed by the Ross Operating Valve Co., Detroit 3, Mich. Especially designed for controlling the water or coolant supply for welders and machine tools. It allows the coolant to flow when needed, but automatically turns it off between the operating periods. A time delay adjustment can be set to maintain the coolant flow for a period of from 0 to 2 1/4 minutes after the machine cycle is completed. It is generally operated by the same power which moves the machine cylinder. 97

Wade Collet with Buttress Thread Ground from Solid

Collet with buttress thread ground from the solid after hardening to eliminate distortion and to insure a high degree of accuracy with respect to concentricity of body, tapered section, thread, and hole. The buttress thread presents a

mating surface at right angles to the pulling force, thus eliminating any expanding tendency and providing maximum strength. Manufactured by the Wade Tool Co., Waltham, Mass. 98

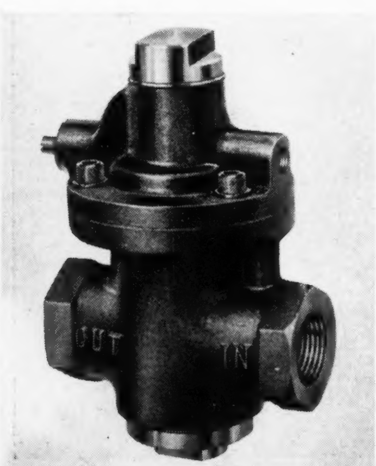


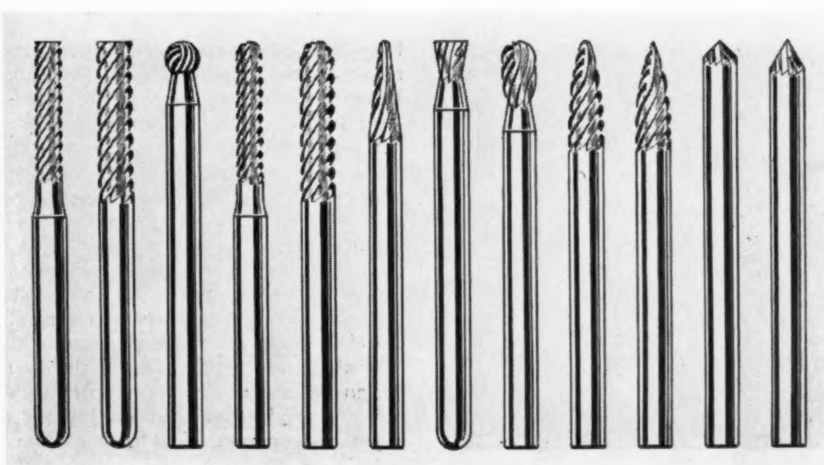
"Shearcutter" Thread Cutting Broach

New tool designed to generate an accurately threaded hole by a true broaching action, designated "Shearcutter" thread cutting broach. The chips removed by this tool are curled up in one piece and flow out of the hole being threaded as shown. The tool can be easily resharpened on a tool and cutter grinder. It can be used to replace taps in tapping machines, automatics, turret lathes, or any machine adapted for tapping operations. Manufactured by the Shearcut Tool Co., Box 746, Reseda, Calif. 99

Severance Carbo-Mills

New series of carbide cutters known as "Carbo-Mills" introduced by Severance Tool Industries, Inc., 636 Iowa St., Saginaw, Mich. These mills have 1/8-inch diameter shanks and are made in one piece of solid carbide. Twelve different shapes are available to meet a wide range of applications. These cutters are adapted for production deburring and machining of parts made from materials that are abrasive or tough, or have a hardness ranging up to 60 Rockwell C. They are equally useful in maintenance work and in tool-rooms. The single-piece construction simplifies balancing at high speeds and makes possible delicate precise work. They can be reground many times. 100

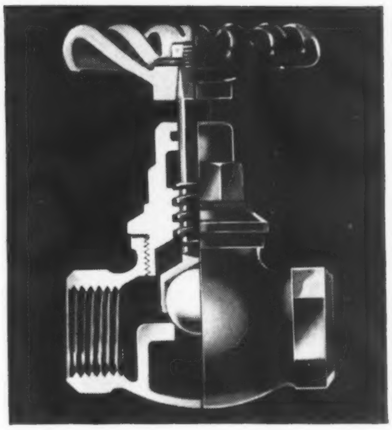


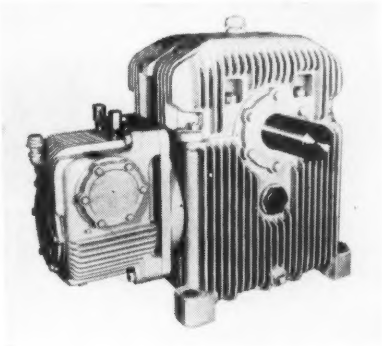


To obtain additional information on equipment described on this page, see lower part of page 216.

Cone-Drive Double-Reduction Speed Reducers

Double-reduction cone-drive unit using standard speed reducers as primary and secondary elements. This is one of a new line of double-reduction units comprising over 86,000 combinations of capacity ratings, models, and gear ratios brought out by the Cone-Drive Division of Michigan Tool Co., 7171 E. McNichols Road, Detroit 12, Mich. The combination of standard reducers provides models with input ratings of from 1/2 to 68 H.P., from 4000 to 244,000 inch-pounds output torque, and reduction ratios of from 25 to 1 to 4900 to 1. An adapter plate and flexible coupling connect the two reducers. 103





Tool "Superchest"

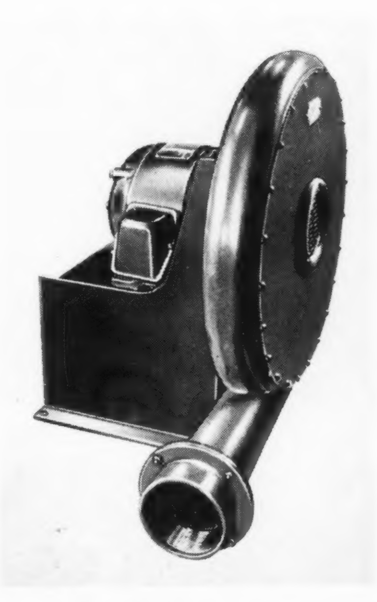
"Superchest" containing combination of "Supersockets" and attachments in 1/4-, 3/8-, 1/2-, and 3/4-inch drives, "Superrenches," pliers, chisels, and screwdrivers, totaling 146 pieces in all. The tools included in the chest were selected to cover a wide range of work from ignition and electronics to truck, bus, and industrial applications. The cylinder lock on hinged front panel securely locks the entire chest. Removable "tote" tray gives easy access to roomy interior compartment. Brought out by J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y. 101

"Bull-Dog-Ball" Valve

"Bull-Dog-Ball" valve in which a precision-ground stainless-steel ball is used to replace the disks, poppets, or other devices commonly employed. The ball is spun into its retainer, a slight clearance being allowed to permit the ball to turn when the valve is opened or closed and thus seat on a new surface each time. "O" ring seals are used for normal service where high temperature is not involved, while conventional packing is used in valves for steam or other high-temperature service. Made in 1/2- and 3/4-inch pipe sizes in brass by Carpenter Mfg. Corporation, 9523 Detroit Ave., Cleveland 2, Ohio. 104

Lindberg-Fisher Blowers

One of a complete new and improved line of single-stage centrifugal blowers brought out by the Lindberg Engineering Co., Air and Hydraulic Division, 2444 W. Hubbard St., Chicago 12, Ill. These blowers feature full 360-degree positioning of the air outlet, and are available in nineteen regular models covering a range of pressures from 8 to 20 ounces, volume capacity range of from 60 to 2100 cubic feet per minute, and a range of motor sizes from 1/3 to 15 H.P...102



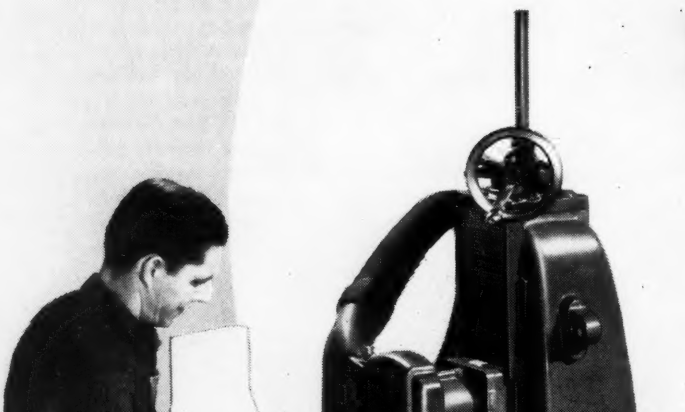
Taft-Peirce Power-Driven Thread Gage Designed for Production Gaging

Power-driven gage designed to speed up the inspection of internally threaded parts and reduce operator fatigue. A new power-driven gaging handle is provided on this device, which is obtainable from the Taft-Peirce Mfg. Co., Woonsocket, R. I. With this inspection tool, manual rotation of the gage is eliminated. Instead, the gaging handle mechanically screws the gage into and out of the threaded work at a speed of four revolutions per second. Immediate reversal or automatic disengagement of the drive is obtained by a slight change in the applied pressure. Available for gage blanks in ten or more regular sizes ranging from No. 4 to 1/2 inch. Made for operation on 110-volt current. ..105

To obtain additional information on equipment described on this page, see lower part of page 216.

for trouble-free surface grinding under extra dusty or severe operating conditions . . .

The New 2L and 2LB Surface Grinding Machines with Built-in Protection



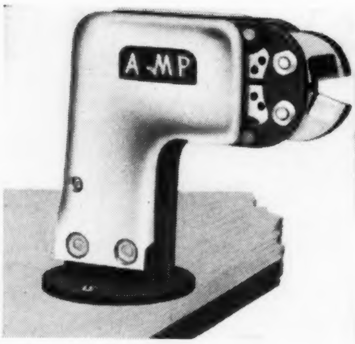
Here are two new Brown & Sharpe Surface Grinding Machines with two important, built-in features for positive protection against dust, grit and severe service conditions. In addition these machines have all the highly-productive features of the popular Nos. 2 and 2B machines.

The new machines Nos. 2L and 2LB have full automatic lubrication and strategically-placed dust guards. These features reduce maintenance costs and extend machine life . . . valuable production and investment-protection advantages.

Like the Nos. 2 and 2B, these machines are made for efficient surface grinding with precision and fine finish on small and medium-size work.

CAPACITY: Grinds work to 18″ long, 6″ wide and 9½″ high, using a wheel 7″ in diameter. No. 2L (illustrated) has automatic feeds; No. 2LB, hand feeds only.

BROWN &

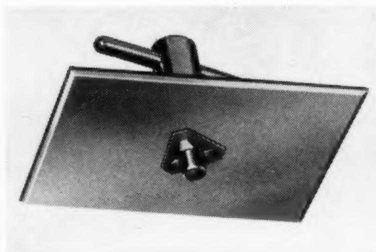


Bench Press with Interchangeable Heads

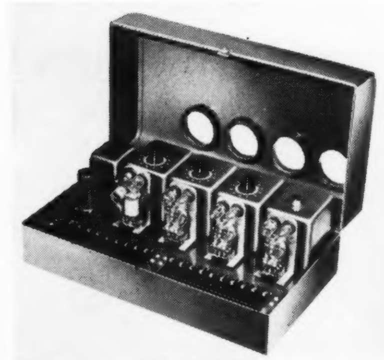
Low-cost "Ampli-Versal" foot-operated bench press with cutting head, developed by Aircraft-Marine Products, Inc., 1582 N. Fourth St., Harrisburg, Pa. Designed to do a clean cutting job on wire, rod, or sheet metal and so made that the cutting head supplied with the press can be easily removed and quickly replaced by any one of seven other special heads. Interchangeable heads are available for performing such operations as indenting, knocking-out, nibbling, U-cutting, notching, and installing AMP solderless terminals. Blank heads for special work are also available. Foot operation of the press leaves both hands of the operator free for guiding the work, and also permits a clear unobstructed view of the part at all times. 106

Truarc Triangular Retainer Ring

Assembly of cross-pin stud and plate, with stud held in place by new self-locking device designated "Truarc Triangular Retainer, Type 5305." Announced by Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N. Y. This device is useful in producing tight assemblies when the assembled piece is a relatively soft shaft of such materials as cold-rolled steel, cast iron, and plastics. No groove or special tools are required for assembly or disassembly. It is made with a flat or spherical cross-section, and has three equally spaced projecting prongs that



lock the retainer securely around the shaft when even the slightest pressure is applied from the opposite direction. These retainers are available in sizes for shaft diameters ranging from 0.090 to 0.375 inch. 107

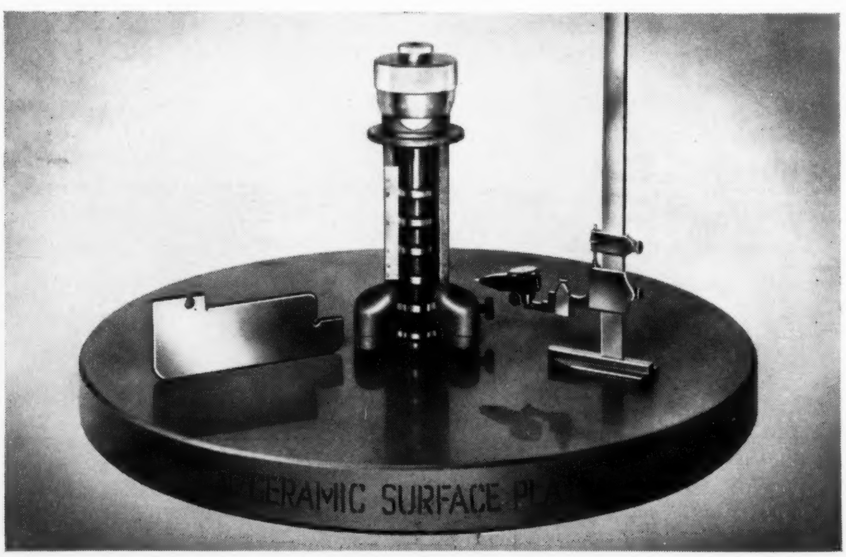


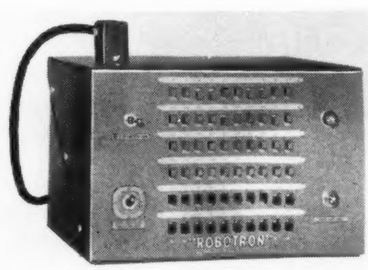
Electric Control Unit

Prefabricated electric control unit designed to provide a packaged system for any type of sequence or process control. Stock plug-in units are available that will handle almost any conceivable sequence of operations. Individual units can be selected to perform the operations required in their proper sequence, including control over time measurement, distance, light, sound, vibration, temperature, and force. All operating stages are automatically interlocked. Where extreme reliability is required, the unit can be used in parallel with similar units. Announced by Hydraulic Research & Mfg. Co., 1500 W. Verdugo Ave., Burbank, Calif. 109

Norton Ceramic Surface Plate

Ceramic surface plate designed by Norton Co., Worcester 6, Mass., for use in tool-rooms and inspection departments where precision set-ups and measurements must be made or checked with the highest degree of accuracy. This plate is made of one of the hardest substances known, and provides extreme wear resistance; a precisely flat surface guaranteed to be accurate within 0.0001 inch; and a continuously smooth surface finish. Exhaustive tests have shown that there is an almost complete absence of wear and that the plate does not become warped or deflect under load. The surface is neither slippery nor sticky, and is especially adapted for bluing. The plate is non-magnetic, will not sweat or corrode, and can be easily cleaned with soap and water. 108

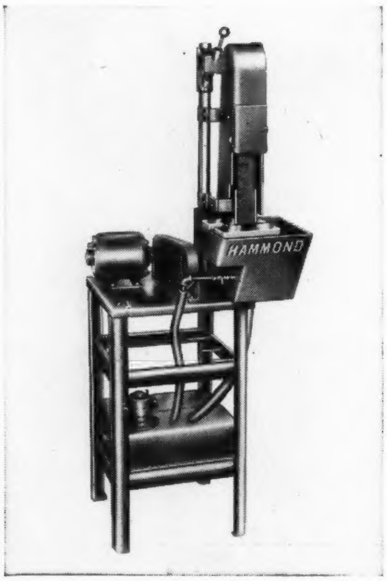




Robotron Control Unit for Hydraulic Molding Presses

Robotron hydraulic molding press control unit recently developed by Emmett Machine & Mfg., Inc., 2249-8 Fourteenth St., S. W., Akron 14, Ohio. This Model 140-X Robotron control, designed to perform automatic "bumping" or "breathing" operations on hydraulic molding presses, can be set to give from 1 to 40 "bumps" during any one operating cycle and to control the over-all cure time. Another important feature is the range of twenty-one different cure times, or periods for each setting of the time switch. Push-buttons provide instant control of all press operations. Once the predetermined cure time and "bumping" arrangements are set, the press will continue to function throughout the operating cycle without additional attention. The new control unit operates as a positive electrical switching device and does not employ gears or cams of any kind. 110

To obtain additional information on equipment described on this page, see lower part of page 216.

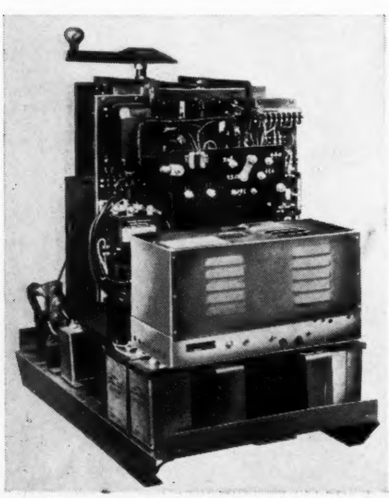


Hammond "Wet-N-Dri" Flexible-Belt Grinder

"Wet-N-Dri" flexible-belt grinder especially suited for wet deburring and finishing of plastics. Permits free belt, contour, or platen finishing with abrasive belts up to 2 1/2 inches in width. Also adapted for deburring, grinding, polishing, shaping, chamfering, squaring, and similar operations on ferrous and non-ferrous metal products, wood, rubber, glass, etc. Shown with self-contained tank and pump unit. This machine is also available for connection to water main, or it can be used dry by shutting off the coolant supply. Brought out by Hammond Machinery Builders Inc., Kalamazoo 54, Mich. 111

High-Frequency Welder

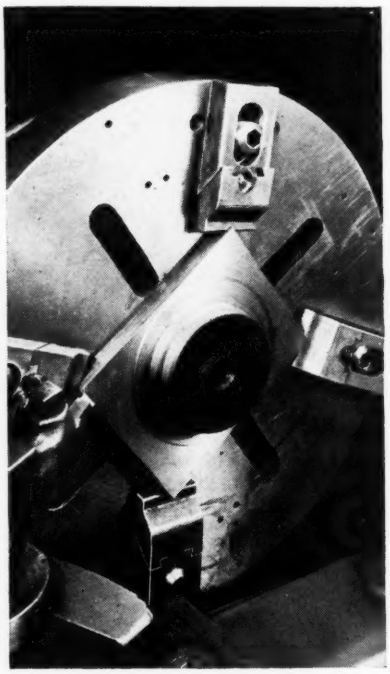
New high-frequency welder for inert-gas arc welding made by National Cylinder Gas Co., 840 N. Michigan Ave., Chicago 11, Ill., and approved by the Federal Communications Commission. Because of its new tube type



oscillator and special torch assembly, this welder will remain on the assigned frequency of 27,120 kilocycles and cause no communications interference by either fundamental or harmonic radiation. The self-contained "Gasarc" oscillator unit shown as part of the welding equipment is available separately for use with other welding machines, and will be an integral part of this company's "Sureweld Gasarc" inert-gas arc welders, which are to be made in six models with capacities ranging from 150 to 750 amperes...112

J & S All-Purpose Jaw Clamps

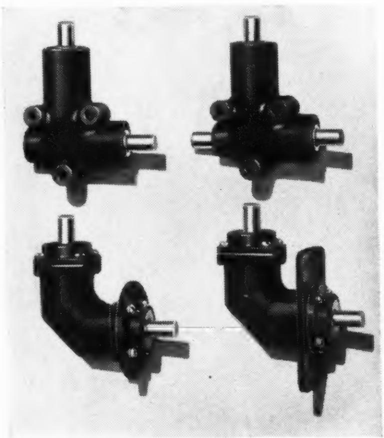
All-purpose jaw clamps of the type illustrated have been placed on the market by the J & S Tool Co., Inc., 477 Main St., East Orange, N. J. These clamps are sold in sets of four for use on lathes,



planers, milling machines, drill presses, etc. The direction of travel of the movable jaw of the clamp is at an angle of 45 degrees with the surface of the faceplate or machine table, so that it forces the work-piece horizontally toward the opposite jaw clamp, and at the same time, moves it downward against the table or faceplate. 113

"Anglgear" Right-Angle Bevel-Gear Drives

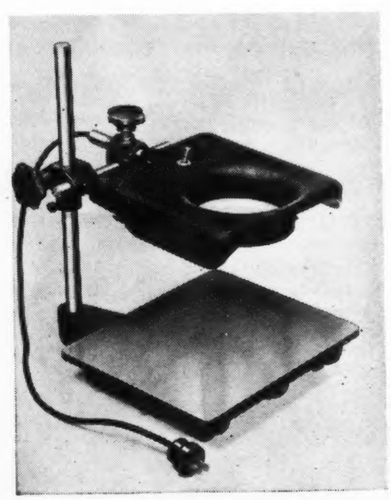
Standardized right-angle bevel-gear drives which are suitable for use in either manual or power operated systems. Specifically designed for the exacting requirements of military and commercial aircraft, but are also adapted for many industrial applications which require precision and durability. These units have high load capacity, long life, and light weight. Available in standard one to one ratio in two sizes and four models with 0.374-inch output shafts and ultimate torsional strength



ratings of 250 and 500 inch-pounds. Developed by Airborne Accessories Corporation, 25 Montgomery St., Hillside 5, N. J. 114

Lay-Out and Inspection Plate with Adjustable Illuminated Magnifier

Precision-ground plate, 11 by 9 inches, with cross-ribs on the under side to insure rigidity. Equipped with illuminated magnifier which can be adjusted to any angle and to any height up to 10 inches. Magnifier has a 4 1/2-inch diameter, specially ground glass and a 25-watt tubular lamp at each side with shields that direct rays on the work being inspected. The plate is provided with 6 feet of rubber-covered cord and a standard plug for 110-volt current. Designed for tool- and die-makers, engravers, etchers, laboratory technicians, and others performing precision work. Made by All American Tool & Mfg. Co., 1014 W. Fullerton Ave., Chicago 14, Ill. 115



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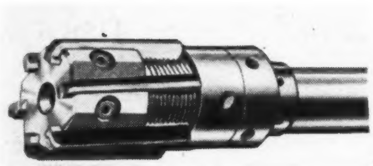
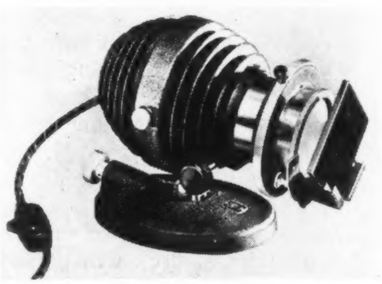


Wendt-Sonis Carbide-Tipped Adjustable Reamers

Carbide-tipped adjustable reamer developed by the Wendt-Sonis Co., Hannibal, Mo. It is available in sizes from 5/8 inch to 4 inches with straight or taper shank, or it can be had in the shell type. One piece of carbide, heavily backed with high-speed steel, runs the full length of the blade. The cutting edges are diamond-lapped, and the threads of the reamer are precision-ground to permit close blade adjustment. Maximum expansion adjustment allows for a large number of regrinds. A special safety lock-nut permits easy replacement and positive locking of the inserted blades. 116



Microscope Illuminator

Microscope illuminator designed to give correct illumination for routine and advanced laboratory work. Announced by the Scientific Instrument Division of the American Optical Co., Buffalo, N. Y. The new Spencer No. 735 lamp furnishes both Kohler and parallel illumination for bright field and phase microscopy, photomicrography, microprojection, and dark field illumination. A standard G-E 100-watt 115-volt bayonet base lamp bulb is used. The illuminator can be obtained with or without an iris diaphragm having both knurled ring and knob adjustments. A single filter-holder for either ground or blue glasses and a multiple holder attachment which takes up to four rectangular filters are available. 117

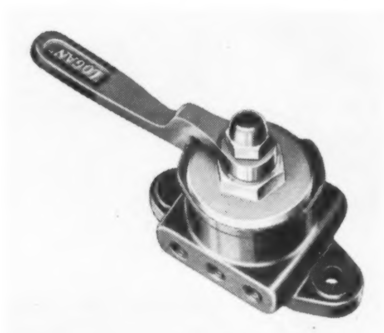
Westinghouse Weld-Time Meter

New weld-time meter for measuring the length of time electric current is applied in making welds. Developed by the Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa., to provide an accurate means for checking the schedule set by the welding control. It can be easily carried in one hand and is direct reading, giving total welding time and values in seconds and cycles. The meter is equipped with a built-in calibrating device, so that it does not

need a separate source of supply, and can be attached directly to the welding machine or control unit. 118

Logan Four-Way Air Control Valve

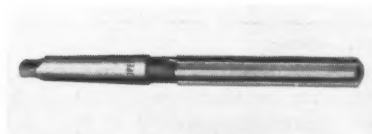
New three-position, double, four-way air control valve for operating two double-acting air cylinders announced by the Logansport Machine Co., Inc., Logansport, Ind. This Model No. 50 valve is of packless, plug type construction, designed to insure long life with minimum maintenance. The brass taper



plug is precision ground and lapped to obtain a perfect seal in the high tensile strength cast-iron body. Made for foot mounting on any flat surface on the machine with the operating handle in a vertical or horizontal position. 119

Core Drill of Improved Design

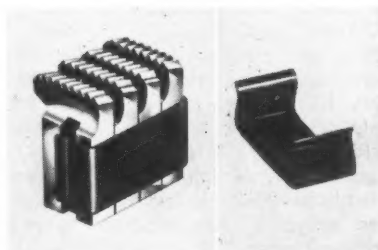
Core drill of improved design announced by Super Tool Co., 21650 Hoover Road, Detroit 13, Mich. Strips of wear-resistant metal are brazed on the tool for the entire length of each flute. The addition of these strips eliminates the abrasive wear caused by cast-iron chips on the body of the drill directly behind



the carbide as well as "loading" conditions which often score the surface of the finished hole. The results are increased core-drill life and a superior hole finish. 120

Geometric Chaser Clip

The Geometric Tool Company, Blake and Valley Sts., New Haven 15, Conn., has recently brought out the spring-steel clip shown at the right in the illustration, which is designed to keep "Supermetric" chasers in order when applied as seen at the left. This clip does away with the former method of wiring and provides a convenient means for holding the chasers together in a complete set



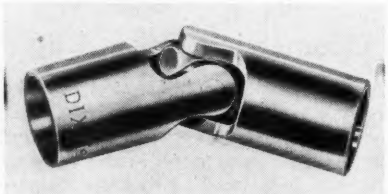
before and after using them. The clip thus prevents the loss of individual chasers or mixing of different sets, saves chaser teeth from damage, and simplifies the issuing of chasers from the tool crib. 121

Williams Crowfoot Wrench Attachments

Adjustable crowfoot wrench attachments brought out by J. H. Williams & Co., 400 Vulcan St., Buffalo 7, N. Y., to combine, in one tool, the flexibility of the detachable socket wrench and the advantages of the open-end adjustable wrench. These adjustable attachments, when used with the numerous handles and parts available, present an almost

To obtain additional information on equipment described on this page, see lower part of page 216.

endless variety of combinations capable of performing many nut-turning jobs previously considered impossible. Attachments are made from selected alloy steel in two square-drive sizes of 3/8 and 1/2 inch, with capacities of 3/4 and 15/16 inch, respectively. Square shoulders on the body portion of the sliding jaw provide maximum resistance to working stresses. 122

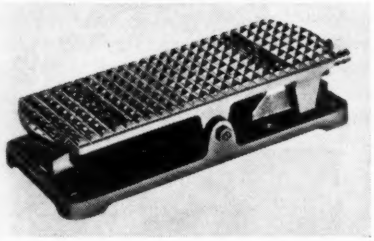


Precision "Dix" Universal Joints

"Dix" precision universal joint built by the Lovejoy Flexible Coupling Co., 5001 W. Lake St., Chicago 44, Ill. Special testing and precision machining equipment holds concentricity within 0.0005 inch. Rivets are ground flush with the body of the joint to permit mounting inside tubing or in close quarters. On special order, the joints can be Magnaflux-tested and cadmium-plated. Fourteen standard sizes ranging in hub diameters from 3/8 inch to 4 inches are available. 123

Fast-Acting Air Control Foot-Valve

Quick-acting foot-valve with minimum air passage equal to 5/16-inch round orifice brought out by Mead Specialties Co., Department FV-26, 4114 N. Knox Ave., Chicago 41, Ill. The self-cleaning poppet type construction insures trouble-free operation. The valve can be used for three-way normally closed



or normally open self-locking operation, and for three-way normally closed or normally open self-releasing service. 124

Heavy-Duty Gloves for Handling Small Castings

New heavy-duty gloves designed for handling small castings, rough stock, parts being ground, and similar work. Recently added to the safety clothing line manufactured by the American Optical Co., Southbridge, Mass. Made of specially treated chrome-tanned cowhide to insure long wear. Provided with a canvas back and elastic strap to produce a cooler, snug-fitting glove. 125

Carbide-Tipped Tool for Screw Machines

Heavy-duty spiral-fluted carbide-tipped drill designed for hand and automatic screw machines and chucking machines, which is now carried in stock by the Super Tool Co., 21650 Hoover Road, Detroit 13, Mich. Developed to fill the need for low-cost carbide-tipped drills in standard sizes of 3/16 inch to 3/4

inch in diameter, varying by 1/64 inch. Made in lengths of 3 inches for the smaller diameter sizes and up to 6 inches in length for larger sizes. 126

* * *

Convention of American Society for Engineering Education

The 1949 convention of the American Society for Engineering Education will be held on June 20 to 24 at Rensselaer Polytechnic Institute, Troy, N. Y. Twenty-five hundred presidents, deans, and professors of leading engineering colleges, scientists, and industrial leaders will attend the conference. The meeting will coincide with Rensselaer's 125th anniversary celebration.

The program will cover various aspects of engineering education, including education in the field of atomic energy; secondary school developments; and selective service problems.

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described in this section is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in APRIL, 1949, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Fill in your name and address on blank below. Detach and mail within three months of the date of this issue to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

NAME.. POSITION OR TITLE..................................

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM..

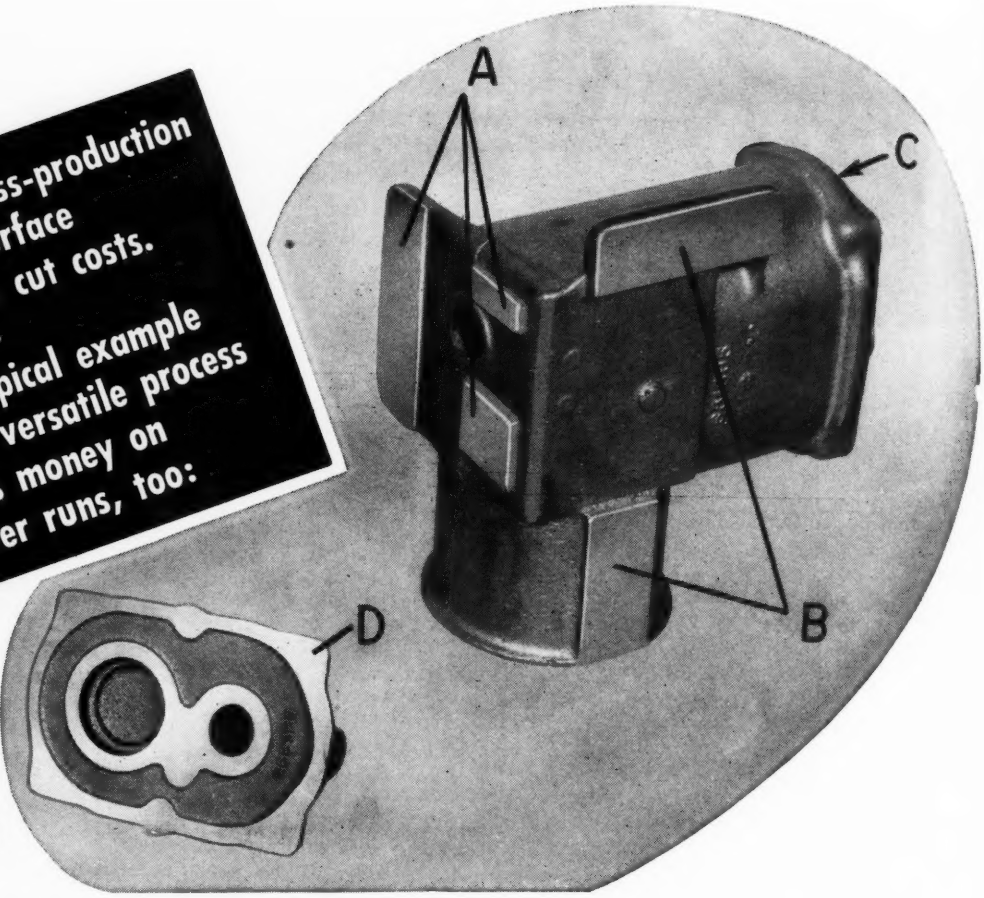
BUSINESS ADDRESS..

CITY.. STATE..

You don't need mass-production to use surface broaching to cut costs.

•

Here's a typical example of how this versatile process saves money on shorter runs, too:



How to cut Machining costs on castings

Shown here are two of **three different castings** requiring the machining of **14 surfaces.** The 3rd casting is similar to the larger one.

All surfaces on all three castings are broached on just **one machine**—a Colonial Dual Ram—with a total of **only two broaches,** one for each ram.

Sure a setup like that cuts costs:

Machining time per face is measured in seconds instead of minutes;

One ram returns and is being loaded while the other is cutting;

Tools have to be removed only rarely for sharpening;

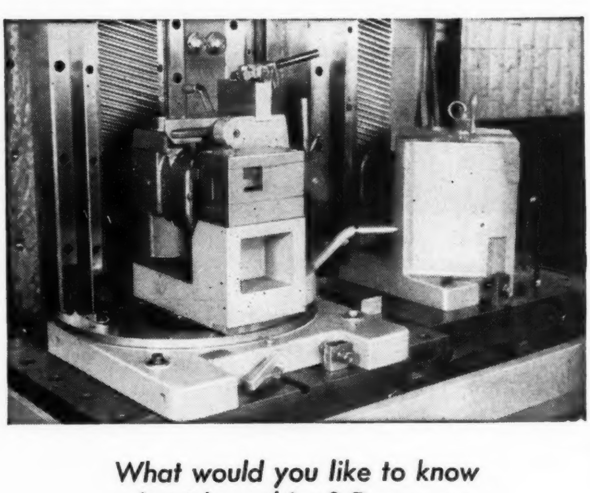
A simple fixture index eliminates extra set-ups;

Tolerances are accurately and automatically held;

In-and-out shuttling of the fixtures is automatic;

Adjusting screws on fixtures allow for unusual stock variations.

Of course your jobs may require a different type of surface broaching set-up—say on a Single Ram machine (with one broach); or on a Universal Horizontal. Regardless of the best machine type, the odds are Colonial can show you some real savings on machining of castings. We will welcome the opportunity.



What would you like to know about broaching? Drop us a line. We'll be glad to help . . .

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 222 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the April, 1949, Number of MACHINERY

Steel-Plate Fabrication

LUKENS STEEL CO., 116 Highway Bldg., Coatesville, Pa. Reference book entitled "Steel Plates and their Fabrication," containing 408 pages of data of value to engineers and designers. Complete information is given on the analyses of physical properties of carbon and low alloy steels, with charts and tables showing their behavior under sustained and repeated loadings, and their resistance to abrasion, corrosion, and temperatures. Engineers and designers can obtain a copy by making a request on a company letter-head directed to the Lukens Steel Co. at the address given above.

Aluminum-Alloy Castings

ALUMINUM INDUSTRIES, INC., Cincinnati 25, Ohio. Illustrated manual entitled "Permite Aluminum-Alloy Castings—Their Production and Application," containing 80 pages of information on the subject. Relative advantages of the different casting methods are discussed, as well as alloys used to obtain desired qualities; effect of design on production costs; and other factors. Management and engineering personnel can obtain a copy by writing on a company letter-head directed to Aluminum Industries, Inc., at address given above.

Oil-Retaining Bearings

BOUND BROOK OIL-LESS BEARING CO., Bound Brook, N. J. Size List 21, covering all the company's types and sizes of porous bronze and sintered iron bearings that can be made from dies on hand. Copies may be obtained by writing on a company letter-head to the Bound Brook Oil-Less Bearing Co.

Steel Tubing Data and Conversion Tables

BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa. New editions of five tables dealing with steel tubing data. Card 115 gives tolerances of round seamless steel mechanical tubing; No. 112 contains a metric conversion table; No. 110 a linear conversion table; No. 103 contains wall thickness data for seamless and welded tubing, and wire and sheet metal gage equivalents, in inches and millimeters, and No. 125 shows the approximate relation of the various hardness testing systems and gives tensile strength of carbon and alloy steels. 1

Drop-Forging Reference Data Book

DROP FORGING ASSOCIATION, 605 Hanna Bldg., Cleveland 15, Ohio. 60-page reference data booklet entitled "Metal Quality," describing how hot-working improves the properties of metals. Information is included on the proper selection of metals for forgings; steps in making forging dies; methods and equipment used in hot-working steel by forging; forging procedures for various kinds of parts; and the economic advantages of forging. 2

Wire Rope Manual

JONES & LAUGHLIN STEEL CORPORATION, Pittsburgh 30, Pa. Manual containing data on the selection of the correct wire rope for a particular job, as well as installation and operating instructions and tables of weight and breaking strength for various sizes. Catalogue data of standard J & L wire rope constructions is included. 3

"Holesteel" Floor Type Drilling and Boring Units

NATIONAL AUTOMATIC TOOL CO., Department 32, Richmond, Ind. Bulletin 848, showing various arrangements of Natco "Holesteel" Model C floor type units used in constructing way type machines for drilling, boring, and tapping. Descriptions of construction details and actual case histories giving production figures are included. 4

Oil-Hydraulic Control Equipment

HYDRAULIC EQUIPMENT CO., 1100 E. 222nd St., Cleveland 17, Ohio. Circulars V12-10948, V13-10948 and V16-11248, describing Hydreco control valves for hydraulic cylinders. Circular P-3000R, illustrating and describing the Hydreco four-bolt high-pressure oil-hydraulic gear pump.....5

Automatic Templet-Controlled Lathe

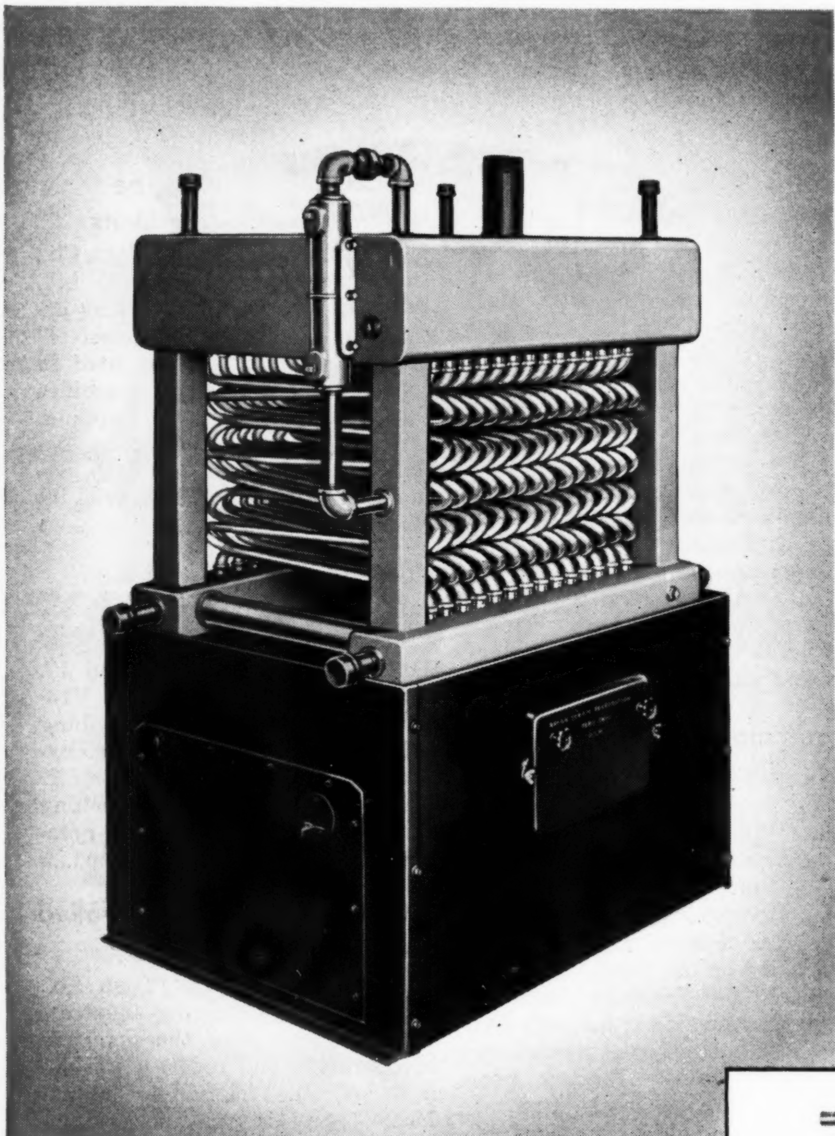
MONARCH MACHINE TOOL CO., Sidney, Ohio. Catalogue illustrating and describing the principle of operation and construction details of the Monarch "Mona-Matic," an air-gage tracer controlled, automatic-cycle production machine for single-point metal turning. 6

Unified Screw-Thread System

EASTERN MACHINE SCREW CORPORATION, 23-43 Barclay St., New Haven, Conn. Publication containing a digest of the new unified screw thread system proposed by the American Standards Association for screws, bolts, nuts, and other threaded parts. 7

COPPER TUBE

A VITAL FEATURE OF BRYAN BOILERS



Bryan Steam Boiler with housing removed, showing copper tubes. Bryan claims 75 pounds of steam in 15 min. from cold start, due to high heat conductivity of the Revere tubes. Also made in low-pressure and hot water models.

THE big feature of the boilers made by the Bryan Steam Corp., Peru, Indiana, is that they use copper tubes. Another important item is engineered design to meet the requirements of the fuel, whether gas or oil. Let Bryan tell the story:

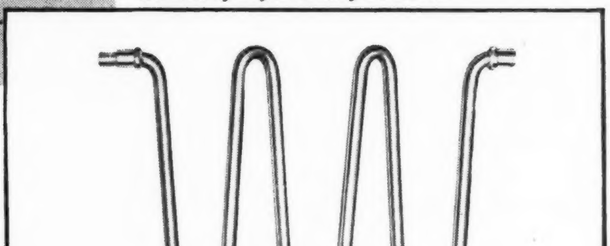
"The Bryan Copper Tube Boiler was started with a double-barreled idea. The first part of the idea was that boilers could be made more efficient by using copper tubes. Copper transfers heat many times as fast as cast iron or steel. Heat from a fire is transferred through copper tubes to water in record time, and in a Bryan Boiler with minimum heat loss through the flue due to the design.

"The second part of the idea was that if a boiler could be engineered expressly for gas or oil, the economy of operation would be such as to revolutionize the heating industry."

The first Bryan Boilers were a sensation when offered over 20 years ago. Today they are made in a number of sizes, from domestic types to 50 hp high-pressure units for industrial uses. Revere Copper Tube is used.

This is another illustration of a favorite Revere statement: "Copper is the metal of invention." Revere makes not only several types of copper tube, but also other copper and copper alloy mill products, and will be delighted to collaborate with you in such matters as selection of the most suitable metal, and fabrication methods to be employed.

Revere copper tube as fabricated by Bryan for boiler use. It is explosion-proof, because should it give after long service, water and steam escape harmlessly. A new tube can be installed in a few minutes by anyone handy with tools.



REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

• • •

Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

Welding Stainless Steel

LINCOLN ELECTRIC CO., Cleveland 1, Ohio. Bulletin 463, entitled "Lincoln Weldirectory for Stainless Steel," giving procedure to follow in the shielded-arc welding and surfacing of stainless steel with various types of electrodes. 8

Speed Reducers

FARREL-BIRMINGHAM CO., INC., 344 Vulcan St., Buffalo 7, N. Y. Bulletin 449, containing complete information on the company's line of speed reducers, including directions for selecting units of the correct horsepower and speed for various applications. 9

Hand Honing Tool

MOTCH & MERRYWEATHER MACHINERY CO., 715 Penton Bldg., Cleveland 13, Ohio. Bulletin 300, describing Delapena precision external hones which are manufactured in England and distributed in the United States by this company. 10

Magnetic Contactors

WARD LEONARD ELECTRIC CO., 31 South St., Mount Vernon, N. Y. Folder on Bulletins 4454 and 4455 alternating-current magnetic contactors for general-purpose industrial control, including machine tool, heating equipment, and lighting applications. 11

Air Press

PARAGON METAL PRODUCTS, 844 W. Adams St., Chicago 7, Ill. Circular describing two new models of air presses designed to increase production on staking, light stamping, press-fit assembling, marking, and similar successive operations. 12

Multiple-Unit Industrial Signals

PANALARM PRODUCTS, INC., 7216 N. Clark St., Chicago 26, Ill. Pamphlet describing multiple-unit industrial signals that provide sound and visual alarms in case of failure or changes in normal operation. 13

Universal Testing Machine

W. C. DILLON & CO., INC., 5410 W. Harrison St., Chicago 44, Ill. Bulletin M, descriptive of the Dillon multi-low-range universal tester for a wide variety of materials. 14

Electric Air Valves

HANNIFIN CORPORATION, 1101 S. Kilbourn Ave., Chicago 24, Ill. Bulletin 230, describing the "Directair" electric valve for the control of single- or double-acting air cylinders, air-operated presses, and similar equipment. 15

Lathe Attachments

SOUTH BEND LATHE WORKS, 383 E. Madison St., South Bend 22, Ind. Catalogue 77-U, describing more than 130 attachments and accessories for South Bend lathes and drill presses, including prices. 16

Press Brakes

VERSON ALLSTEEL PRESS CO., 9309 S. Kenwood Ave., Chicago 19, Ill. Bulletin JIB-49, describing the company's lines of Junior and intermediate press brakes, including design details and specifications. 17

Electric Motors

RELIANCE ELECTRIC & ENGINEERING CO., 1076 Ivanhoe Road, Cleveland 10, Ohio. Bulletin B-2101, containing selection data on the company's line of integral-horsepower, precision-built, alternating-current motors. 18

Liquid Blast-Cleaning Equipment

PANGBORN CORPORATION, Hagerstown, Md. Bulletin 1400, descriptive of the Pangborn Hydro-Finish cabinet for liquid blast cleaning, which is said to hold tolerances to 0.0001 inch. 19

Vises

GRAHAM MFG. CO., INC., 120 Bridge St., East Greenwich, R. I. Bulletin 44, describing two new vises, as well as the standard "multi-purpose" vise made by the company, and the Graham knurl-holder. 20

Portable Hardness Tester

RIEHLE TESTING MACHINES DIVISION, AMERICAN MACHINE AND METALS, INC., East Moline, Ill. Circular descriptive of the new Riehle portable hardness tester for Rockwell readings. 21

Hydraulic Seals

MILLER MOTOR CO., 4027 N. Kedzie Ave., Chicago 18, Ill. Pamphlet entitled "Hydraulic Seals," analyzing advantages and disadvantages of the various types of "sliding type" hydraulic seals now in use. 22

Hydraulic Surface Grinders

DOALL CO., Des Plaines, Ill. Circular illustrating and describing the latest models of DoAll hydraulic surface grinders for tool-rooms and production lines, and typical applications. 23

Special Machinery

WIEDEMANN MACHINE CO., 4272 Wissahickon Ave., Philadelphia 32, Pa. Booklet describing the equipment and facilities of this company for designing and constructing special machinery.....24

Standardized Gear Units

AIRBORNE ACCESSORIES CORPORATION, 25 Montgomery St., Hillside 5, N. J. Circular describing the design of standardized "Angl" gear units for aircraft and industrial applications. 25

Surfacers and Grinders

BUEHLER LTD., 165 W. Wacker Drive, Chicago 1, Ill. Bulletin giving specifications for AB wet power grinders, duo-belt wet surfacers, and bench grinders for metallurgical laboratory use.....26

Hydraulic Broaching Machines

ACME BROACH CORPORATION, Milan, Mich. Bulletin H-48, illustrating and describing the Acme line of horizontal hydraulic broaching machines. 27

Electric Hoists

WRIGHT HOIST DIVISION, AMERICAN CHAIN & CABLE CO., INC., York, Pa. Folder DH-65, describing the improved features of the new line of Wright Speedway electric hoists. 28

Numbering Machines

NUMBERALL STAMP & TOOL CO., Huguenot Park, Staten Island 12, N. Y. Circular on hand and automatic numbering machines for use on metals, plastics, and other materials. 29

New and Rebuilt Machines

J. L. LUCAS & SON, INC., Bridgeport 5, Conn. Circular listing a variety of new and rebuilt machine tools. 30

Punch Presses

SALES SERVICE MACHINE TOOL Co., 2363 University Ave., St. Paul W4, Minn. Bulletin P348, descriptive of six models of Press-Rite open-back inclinable punch presses with 5 to 30 tons capacity. 31

Drill Jigs and Fixtures

SIEWEK TOOL Co., 2862 E. Grand Blvd., Detroit 2, Mich. Catalogue 7, containing 150 pages of data on the Siewek line of rapid-clamping drill jigs, clamps, and fixture details. 32

Saw-Sharpening Fixture

TREYCO PRODUCTS, 264 Hartford Ave., Buffalo 17, N. Y. Circular descriptive of a saw-holder of simple design for use in sharpening circular saws of various sizes and types. 33

Automatic Transmissions

WESTERN MFG. Co., 3400 Scotten Ave., Detroit 10, Mich. Leaflet describing a two-speed automatic transmission used to supplement constant-speed and multi-speed motors. 34

Flexible Shafting

ELLIOTT MFG. Co., 350 State St., Binghamton, N. Y. Catalogue 49, covering the company's complete line of flexible-shafting equipment for power drives and remote controls. 35

Lift-Trucks

BARRETT-CRAVENS Co., 4609 S. Western Blvd., Chicago 9, Ill. Bulletin 4883, showing the improved line of Barrett lift-trucks in capacities from 1000 to 15,000 pounds. 36

Hydraulic Shapers

ROCKFORD MACHINE TOOL Co., Rockford, Ill. Bulletin 300, illustrating and describing the 36-inch open - side "Hy - Draulic" shaper. 37

High-Speed Steels

JESSOP STEEL Co., Washington, Pa. Catalogue describing the analyses, heat-treatments, and applications of five commonly used types of high-speed steels. 38

Electric Control

WESTINGHOUSE ELECTRIC CORPORATION, P.O. Box 868, Pittsburgh 30, Pa. Booklet describing the "Rototrol," a regulator used in the steel industry. 39

Profile Projector

HAUSER MACHINE TOOL CORPORATION, Manhasset, N. Y. Bulletin containing complete information, including specifications, on a new profile projector. 40

Resistance Heaters

AGNEW ELECTRIC Co., Milford, Mich. Leaflet describing resistance heaters, built in semi-automatic or fully automatic single- or multiple-station types. 41

Guide for Spring Buyers

ILLINOIS COIL SPRING Co., 2100 N. Major Ave., Chicago 39, Ill. "Brief Guide for Spring Buyers," describing the principal types of springs and their uses. 42

Ball-Tilting Milling Table

LEO G. BROWN ENGINEERING Co., 1531 S. Sunol Drive, Los Angeles 23, Calif. Leaflet descriptive of new rotary-feed ball-tilting milling work-table. 43

Lubrication

BIJUR LUBRICATING CORPORATION, 43-01 Twenty-second St., Long Island City 1, N. Y. Bulletin 4C, entitled "Metered Lubrication for the Small Machine."....44

Mobile Crane Unit

CLYDE IRON WORKS, INC., Duluth 1, Minn. Circular MP-40, illustrating and describing the new all-purpose "Handi-Crane," mounted on a tractor. 45

Steel Folding Rule

DURALL TOOL CORPORATION, 117 Woodworth Ave., Yonkers, N. Y. Circular describing a 6-foot alloy-steel folding rule with white enamel finish. 46

V-Belt Wall Chart

MANHEIM MFG. & BELTING Co., Manheim, Pa. Wall chart showing how to measure, uncouple, couple, and install Veelos link V-belt...47

Toolmaker's Microscope

BOECKELER INSTRUMENT Co., 31 E. Rillito St., Tucson, Ariz. Circular descriptive of the company's new toolmaker's microscope.......48

Cerro-Alloy Applications

CERRO DE PASCO COPPER CORPORATION, 40 Wall St., New York 5, N. Y. Series of data sheets on applications of Cerro alloys.......49

To Obtain Copies of New Trade Literature

listed in this section (without charge or obligation), fill in below the publication wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue (April, 1949) to MACHINERY, 148 Lafayette Street, New York 13, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

NAME..POSITION OR TITLE....................................

[This service is for those in charge of shop and engineering work in manufacturing plants.]

FIRM...

BUSINESS ADDRESS...

CITY..STATE...

By E.S.S.

BETWEEN GRINDS

Our Staff is not Distaff

Our foreign mail contained a letter addressed to "Mrs. Industrial Press." Feeling somewhat like a beauty contestant in Atlantic City, we deduced that the typist misunderstood "Messrs."

Take One, or Two, or Three

As part of an employe-information program, General Motors plants have installed free literature racks. Three pamphlets are available each week, the most popular being retained and the other two replaced. Will you have "ABC's of Hand Tools," "Ker-choo and You," or "Blueprint for Savings" this week?

Aurora Bookealis

The Precious Trading Co., who occupy the Noble Chambers (2nd floor, lift No. 2) in Bombay, purchase our books.

Metallic Missionary

"Some metals are lazy. They prefer to do nothing constructive, to perform no useful function. But, like many a lazy man, when prodded they often produce sensational results. One outstanding convert to a useful life, long ago, has been tungsten." The Westinghouse research engineer who wrote this now has a diligent eye on titanium, molybdenum, and tantalum.

Our Photogenic Model – the Handbook

Pleasure-bent in a camera magazine, we were surprised at coming face to face with a photograph showing MACHINERY'S HANDBOOK as part of the contents of a tool chest spread out to illustrate the equipment needed in the repair of a camera. The picture of the tool chest, in turn, reminded us of a manufacturer who wrote asking whether we planned to retain the dimensions of the HANDBOOK in the future because he was designing a tool chest with a compartment specifically built to our contours.

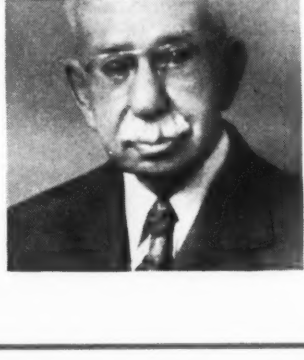
Press Gets Cold Shoulder

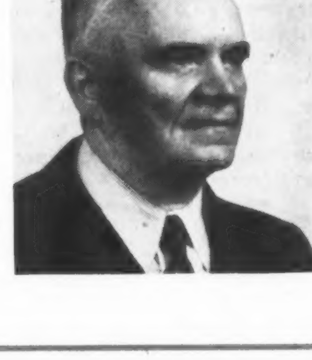
To set a 275,000 pound 20-foot press on its side for shipment, Chevrolet engineers recently resorted to an old trick of the construction trade. They stacked 350 cakes of ice behind the press, letting them congeal to a solid block. The press was then tipped over against the ice block and as the ice melted the press sank over on its side.

You Ort to Watch Your Spelling

From an advertising agency we received some material along with a letter asking " . . . whether it is the sought of thing you can use—any comment or criticism would be appreciated."

BECKETT and BRAUN, two consistent readers of MACHINERY (by consistent we mean subscribers of fifty years' standing apiece), are now receiving from us what might be termed "semper fidelis" rewards, or more concretely, MACHINERY with our compliments. On the left, is John R. Beckett of Dorchester, Mass.; on the right, John T. Braun of Chicago, Ill. Both Johns started their careers from the apprentice springboard—Beckett at the age of eighteen in Manchester, N. H., working in a locomotive works for three years on a sliding salary scale of from $3.50 to $7.50 per sixty-hour week, and depositing $100 as a guarantee that he would stay the period—Braun at the age of sixteen serving without pay for six months in a tool and die shop. Then Beckett took the advice of his superior who told him to rotate in a number of shops until he decided to settle down. Which he did until World War I found him superintendent in a concern making cartridges for rifles. [During this period, Mr. Beckett described to us, in a reminiscent vein, how he stepped up production considerably as a result of reading an article in MACHINERY on the use of a special steel for punches and dies.] The war over, he opened his own machine shop in Manchester, which he maintained until his retirement in 1943. Mr. Braun, his apprenticeship completed, started off on a different track bv signing up with one of the big ore boats sailing from Lake Superior to Lake Erie, returning to Chicago after four years on the Lakes to operate stationary steam plants. In 1905, he was certified as a machinist for the City of Chicago. Thirty-nine years of civil service saw him first in the power plants and pumping stations of the water department, and then in the Board of Education as foreman of machines until his retirement in 1944.





News of the Industry

Bruce F. Olson, president and general manager of the Sundstrand Machine Tool Co.

Illinois

BRUCE F. OLSON was elected president and general manager of the Sundstrand Machine Tool Co., Rockford, Ill., succeeding his father, the late Hugo L. Olson, at a recent meeting of the board of directors. Other newly elected officers of the company are as follows: O. G. NELSON, chairman of the board; GILMORE J. LANDSTROM and GUST H. EKSTROM, vice-presidents; and HOWARD H. EKSTROM, assistant secretary and treasurer.

AMGEARS, INC., Chicago, Ill., manufacturer of production and precision gears, announces the appointment of the following new representatives: VEE MAC CO., 129 Calvin Park Blvd., Rockford, Ill.; and the ALLIED TRANSMISSION EQUIPMENT CO., 1733 Main St., Kansas City, Mo.

TOOL EQUIPMENT CO., 24 S. Pulaski Road, Chicago 24, Ill., has been appointed exclusive factory representative in the states of Illinois and Iowa for the MULTI-HYDROMATIC WELDING & MFG. CO., East Detroit, Mich., manufacturer of resistance welding equipment.

SCULLY-JONES & CO., 1901 S. Rockwell St., Chicago 8, Ill., announces the formation of an Engineering and Design Service Division, the objective of which is to offer service on operational procedure, engineering and processing methods, and tool and machine design.

WHITING CO., Harvey, Ill., announces the election of the following officers at the recent annual meeting of the company: President, JOHN GORDON; vice-president, A. D. CORLEW; secretary, MILDRED BLACK; and treasurer, A. D. HESS.

WILLIAM N. BROWN has been appointed Chicago district purchasing agent of the American Steel & Wire Co., Rockefeller Bldg., Cleveland 13, Ohio, succeeding I. E. BOWEN, who has been named assistant to the purchasing agent.

BERNARD R. BETTER has been appointed director of research of Scully-Jones & Co., 1901 S. Rockwell St., Chicago 8, Ill.

Indiana and Missouri

A. B. BOLENDER, well-known gear production expert, announces his retirement from the Warner Gear Co., Muncie, Ind., after thirty-nine years of service. Mr. Bolender will be available for a limited number of lectures on quality and production methods, as well as consultation. He can be reached at 711 University Ave., Muncie, Ind.

A. B. Bolender, who has retired from the Warner Gear Co. after thirty-nine years of service

DIAMOND CHAIN CO., INC., Indianapolis 7, Ind., maker of roller chains sprockets, and flexible couplings, has appointed the following distributors: APEX POWER EQUIPMENT CO., 4047 W. 26th St., Chicago, Ill.; RAY M. RING CO. 1234 W. Washington Blvd., also of Chicago; and W. F. MCGRAW & CO., 575 E. Milwaukee St., Detroit, Mich.

VONNEGUT MOULDER CORPORATION, 1819 Madison Ave., Indianapolis, Ind., has recently sold its woodworking machine division to the G. M. DIEHL MACHINE WORKS, INC., Wabash, Ind., and will confine its activities in the future to the production of the Marschke line of grinding and buffing machines.

STANDARD LOCKNUT & LOCKWASHER, INC., announces the removal of the company from 311 N. Capitol Ave., Indianapolis, Ind., to larger quarters at 118 W. St. Clair St.

ILLINOIS TOOL WORKS, 2501 N. Keeler Ave., Chicago 39, Ill., has appointed the K. P. WESSELING CO., St. Louis, Mo., sales representative in the St. Louis area.

Michigan

BARRON D. BERGER has recently been made chief engineer of the National Electric Welding Machines Co., Bay City, Mich. He was formerly assistant chief engineer in charge of special machine design with the Federal Machine & Welder Co., Warren, Ohio, and also served in the capacity of engineering assistant to the vice-president and general manager of the Welding Division of that company.

SNYDER TOOL & ENGINEERING CO., Detroit, Mich., builder of production machines for the automotive and similar industries, has purchased the ARTHUR COLTON CO., builder of production machines for the drug, plastics, and packaging industries. Manufacturing operations will be transferred to the Snyder plant, but the new subsidiary will continue to operate under the name of the Arthur Colton Co.

PERFEX GAGE & TOOL CO., 123 Avery, Mount Clemens, Mich., has appointed the following representatives: FRED D. MARTIN, 4738 Lexington Ave.,

This booklet tells you why...

ONLY PHILLIPS SCREWS offer these 5 essentials of a STANDARD Cross Recessed Head Screw

Because Phillips, and *only* Phillips Recessed Head Screws meet all five requirements, they are your logical choice for practical production driving. Specify Phillips and gain *all* the advantages that *standard* Cross Recessed Head Screws can contribute to your product's manufacture.

Everyone in Industry responsible for screw selection should have this Fact-Full Booklet.

It lets you in on the important facts you can't afford to overlook when you choose cross recessed head screws. It's FREE. Use the coupon . . . send it today.

PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

27 SOURCES

American Screw Co.
Camcar Products Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Rockford Screw Products Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wales-Beech Corp.
Wolverine Bolt Company

Phillips Screw Mfrs., c/o Horton-Noyes Co.
1800 Industrial Trust Bldg., Providence, R. I.

Send me the new booklet — "How to Select Recessed Head Screws for Practical Production Driving".

Name . . . .

Company . . . .

Address . . . .

M40

Cleveland, Ohio; F. W. COOPER Co., 102 N. West Ave., Syracuse, N. Y.; WALTER J. MEINHARDT, 2800 Milwaukee Ave., Chicago, Ill.; and SHIVELY SALES Co., 719 E. Second Ave., Flint 3, Mich.

O. W. YOUNG, general manufacturing manager of the Buick Motor Division, Flint, Mich., has been named executive assistant to the general manager. E. T. RAGSDALE, assistant chief engineer, succeeds Mr. Young as general manufacturing manager. HARRY C. DOANE and RICHARD C. COOK become assistant chief engineers.

ABDITE GAUGE Co., Dearborn, Mich., manufacturer of precision tools and gages, jigs and fixtures, and tube and molding rolls, announces the election of the following new officers: President, ARNOLD KAIANDER; vice-presidents, STEVEN COLOSKIE and OLIVER LASZLO; and secretary and treasurer, STANLEY CZARNIK.

J. R. ELDER has been appointed field representative for the Tomkins-Johnson Co., Jackson, Mich., manufacturer of air and hydraulic cylinders, riveters, die-sinking cutters, and air controls.

EMIL GAIRING, president of the Gairing Tool Co., Detroit, Mich., was elected president of the Cutting Tool Manufacturers' Association at the recent annual meeting in Detroit. He succeeds D. E. VAN DEUSEN, president and general manager of the Kelly Reamer Co., Cleveland, Ohio. NORMAN LAWTON, works manager of the Star Cutter Co., Detroit, Mich., was elected vice-president of the Association, and R. S. SPENCER, president of the Detroit Boring Bar Co., was elected treasurer.

Emil Gairing, newly elected president of the Cutting Tool Manufacturers' Association

FARREL-BIRMINGHAM Co., INC., Ansonia, Conn., announces the appointment of M. H. BLANK as representative in the Detroit area to handle the sale of the company's line of gears and gear units. Mr. Blank's offices are at 901 Lafayette Bldg., Detroit 26, Mich.

STANDARD PATTERN WORKS, MACHINE DIVISION, announces the removal of the company to 13781 Concord Ave., Detroit, Mich., where improved facilities are available for rebuilding all types of metal-working machines.

ILLINOIS TOOL WORKS, Chicago, Ill., has appointed EDWARD D. WIARD as the company's representative in the Detroit territory. Mr. Wiard will be in charge of the company's sales office at 2895 E. Grand Blvd., Detroit, Mich.

CHROME ELECTRO-FORMING Co., 7515 Lyndon Ave., Detroit 21, Mich., has recently been formed to provide a chromium-plating service by a new precision process known as the Morey process.

WILLIAM F. EMERY has been appointed district manager of the Detroit office of the Bristol Co., Waterbury, Conn. His offices are at 1627 W. Fort St., Detroit 16, Mich.

New England

BULLARD Co., Bridgeport, Conn., manufacturer of vertical turret lathes, Mult-Au-Matic lathes, horizontal lathes, and spacers, have acquired the business and products of the UNIVERSAL BORING MACHINE Co., Hudson, Mass. Manufacture of the horizontal boring mills made by this company will be continued at the Bullard plant. The machines will be known as the Bullard-Universal boring machines, and will be made in three spindle sizes, of 3, 4, and 5 inches. The Bullard Co. will also continue the manufacture of the precision machine aligning level formerly made by the Universal Boring Machine Co.

BRIDGEPORT SAFETY EMERY WHEEL Co., Bridgeport, Conn., has been purchased by a group headed by JOHN T. KILBRIDE, president of the Bridgeport-Diamond Machine Co., and is again in operation after a suspension of work of about six months. Operation of both plants will be at Stratford, Conn. The new management will continue the same general lines of machine tools, including face grinders, vertical surface grinders, knife grinders, and special grinding machines.

LESLIE MCARTHUR, vice-president of the Niles-Bement-Pond Co., West Hartford 1, Conn., has been elected a member of the board of directors. Mr. McArthur has been connected with the Niles-Bement-Pond organization since 1947.

© Fabian Bachrach

Edmond A. Neal, recently appointed assistant director of sales for Nicholson File Co.

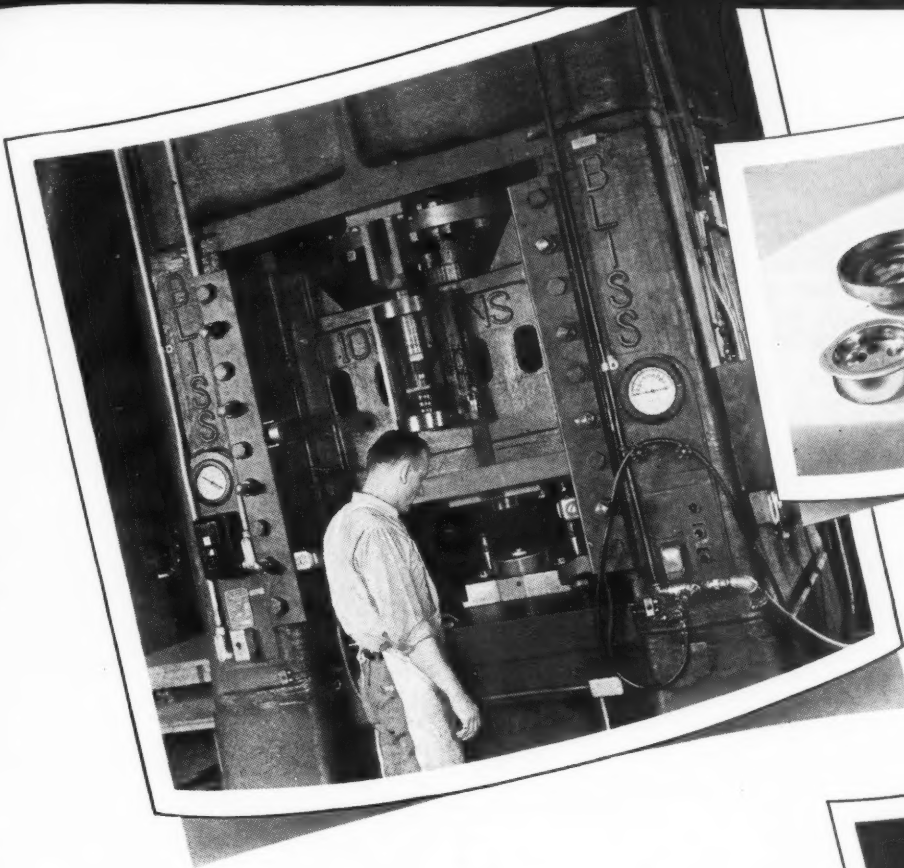
EDMOND A. NEAL has been appointed assistant director of sales for the Nicholson File Co., Providence, R. I. Mr. Neal has been connected with the company since 1939, starting work as a service engineer in New York City. He has served as sales representative in the Philadelphia and New York areas, and prior to his present appointment was engaged in market analysis and allied duties as assistant to H. L. WHITNEY, director of sales at the headquarters in Providence.

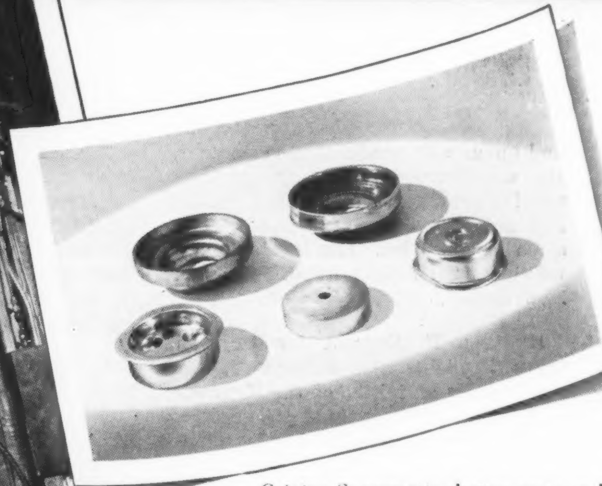
RICHARD A. HEALD, treasurer of the Heald Machine Co., Worcester, Mass., was elected president at the annual meeting of the corporation, succeeding his brother, ROGER N. HEALD, who has become chairman of the board. Roger Heald has been president since 1931.

DIAMOND CHAIN Co., INC., Indianapolis 7, Ind., manufacturer of roller and conveyor chains, sprockets, and flexible couplings, has appointed CHASE, PARKER & Co., INC., 288-290 Congress St., Boston, Mass., distributors for the Boston area.

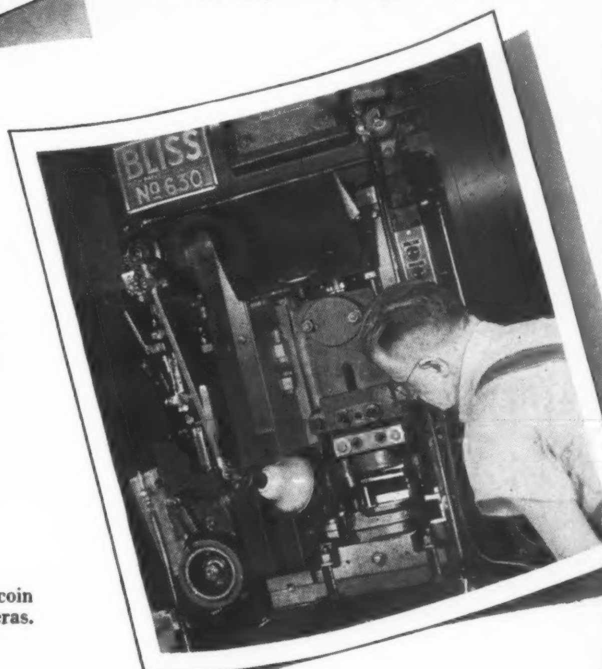
New Jersey

RICHARD E. HITCHCOCK has been appointed field engineer and sales representative in the New York area for the Hannifin Corporation, Chicago, Ill., manufacturer of hydraulic



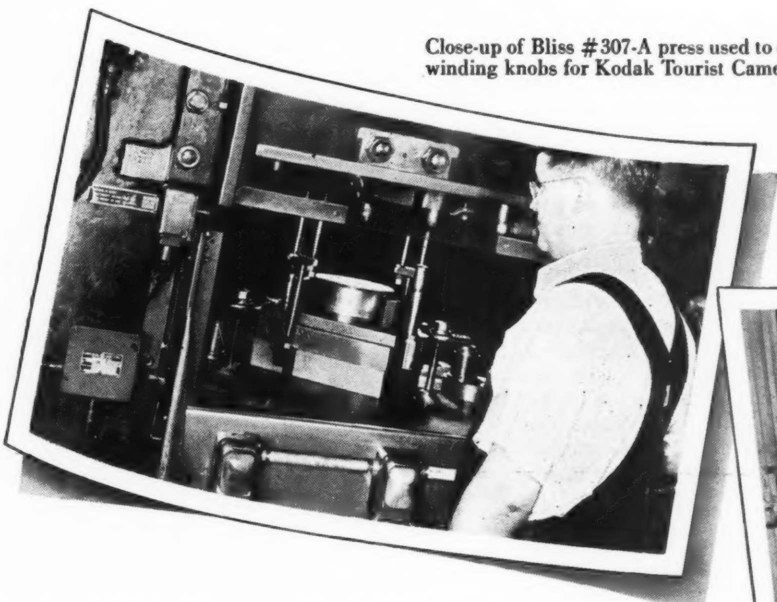


Coining Supermatic shutter cases on Bliss 1000-ton hydraulic press. Inset shows before and after samples. Steps on inside of right-hand sample are held to .001" for position and flatness. Below are blank and two parts of head for tripod. Top part, center, has three depressions—held smooth and hemispherical. Serrations in bottom, right, are accurately radial, sharp and uniform.

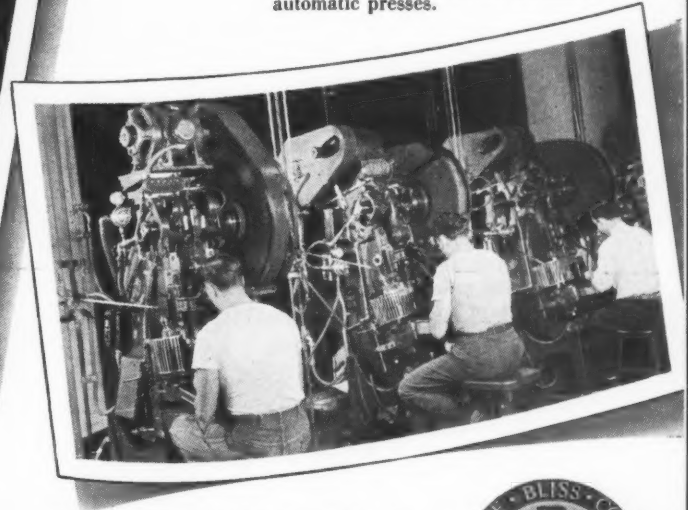


Several hundred presses at Camera Works produce wide variety of equipment

Close-up of Bliss #307-A press used to coin winding knobs for Kodak Tourist Cameras.



Progressive dies produce various parts for the Baby Brownie Special Camera on Bliss automatic presses.



E. W. BLISS COMPANY, DETROIT 2, MICHIGAN

Mechanical and Hydraulic Presses, Rolling Mills, Container Machinery

WORKS AT: Toledo, Cleveland, Salem, Ohio; Hastings, Mich.; Englewood, N. J.; Derby, England; St. Ouen sur Seine, France. SALES OFFICES AT: Detroit, Hastings, Mich.; New York, Rochester, N. Y.; Cleveland, Dayton, Toledo, Salem, Ohio; Philadelphia, Pittsburgh, Pa.; Chicago, Ill.; New Haven, Conn.; Windsor, Ont.

Part of a battery of 45 Bliss #19-C inclinable presses used for a variety of secondary operations. Accuracy is paramount.

MARQUETTE · BLISS · CONSOLIDATED · TOLEDO · BLISS BUILT

THAN ANY OTHER COMPANY IN THE WORLD

and pneumatic production equipment. He was formerly East Coast engineering representative for the Bendix Products Division of the Bendix Aviation Corporation. His headquarters will be at 201 Abbott Road, Fairlawn, New Jersey.

RUSSELL F. STUART, for thirteen years head of the eastern United States sales activities of the Kearney & Trecker Corporation, Milwaukee, Wis., has been appointed sales manager for the Walker-Turner Division of the corporation, located at Plainfield, N. J.

J. K. SMIT & SONS, INC., announce that the home office and complete manufacturing facilities have now been moved to the company's new quarters in Murray Hill, N. J., to which address all correspondence should be directed.

New York

FRANK T. SISCO has been appointed technical director of the Engineering Foundation, 29 W. 39th St., New York 18, N. Y., the joint research agency of the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. Mr. Sisco has been in charge of Alloys of Iron Research for the Foundation since 1930, and will continue with this project for the present, in addition to carrying on his new duties.

GEORGE A. GRANTHAM has been appointed chief engineer of Weddell Tools, Inc., Rochester, N. Y., manufacturers of metal-cutting tools. Mr. Grantham came to this country in December, 1948, from England, where he had been associated with Messrs. Richard Lloyd, Ltd., manufacturers of inserted-blade cutting tools, in the capacity of assistant to the managing director.

DR. G. V. SLOTTMAN has been appointed director of research and engineering for the Air Reduction Co., Inc., 60 E. 42nd St., New York 17, N. Y. Dr. Slottman, who joined the company in 1934, served as manager of the technical sales division until 1948, when he became technical assistant to the vice-president in charge of sales.

NORBERT L. ENRICK, formerly associate professor at Louisiana State College, Southwestern Louisiana Institute, and author of the book "Quality Control," is now associated with the P.O.M. Co., industrial consultants, and Werner Textile Consultants, 60 E. 42nd St., New York 17, N. Y., as quality control engineer.

ROY E. JONES has been promoted from the position of assistant export manager to export manager of the Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill. He succeeds CARL A. WOERWAG, who is retiring because of ill health. Mr. Jones will make his headquarters in New York City.

A. H. ROSS CO., INC., Dayton 1, Ohio, subsidiary of ROCKWELL MFG. CO., announces the appointment of W. A. RADFORD, 509 Fifth Ave., New York City, as New York representative. Mr. Radford succeeds the former representative, A. G. HORNNEY of Hornney & Co.

R. F. V. STANTON, vice-president in charge of manufacturing of the American Machine and Foundry Co., 511 Fifth Ave., New York 17, N. Y., has been elected a member of the company's board of directors.

GEORGE G. RAYMOND, JR., was recently elected vice-president of the Lyon-Raymond Corporation, Greene, N. Y., at a meeting of the board of directors. Mr. Raymond will also continue to serve as sales manager.

JOHN J. MEADOWS has joined Sam Tour & Co., Inc., 44 Trinity Place, New York 6, N. Y., to supervise the reorganization of the mechanical engineering department.

KENNAMETAL INC., Latrobe, Pa., manufacturer of cemented-carbide products, has moved its New York office to 11 W. 42nd St. L. D. MORTON is acting manager of this office.

Ohio

M. S. DOWNES has been appointed general sales manager of the Railway Division of the Timken Roller Bearing Co., Canton, Ohio, succeeding the late W. C. Sanders, under whom he has been assistant general sales manager for the last twenty years. J. E. MCCORT, previously district manager of the Railway Sales Division in Cleveland, will fill Mr. Downes' former position. RALPH G. HARMON, a sales engineer in the company's Chicago office, has become district manager of the Industrial and Steel and Tube Divisions in Birmingham, Ala., replacing F. B. CARNEY, who has resigned.

VINCENT A. SCHMIDT, since 1940 production manager of Baker Brothers, Inc., Toledo, Ohio, builder of machine tools and other machinery, has joined the Nelson Stud Welding Division of Morton Gregory Corporation, Lorain, Ohio. He will serve as field engineer for the company in northwestern and central Ohio and northeastern Indiana, with headquarters in the Manhattan Bldg., Toledo, Ohio.

J. P. Vederko, recently appointed works manager, Hydraulic Press Mfg. Co.

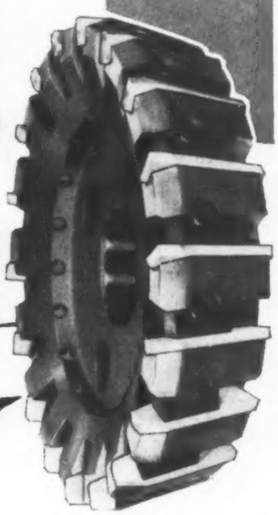
J. P. VEDERKO has been appointed works manager of the Hydraulic Press Mfg. Co., Mount Gilead, Ohio. He succeeds E. J. MCSWEENY, formerly vice-president in charge of manufacturing, who resigned recently. Mr. Vederko was formerly general superintendent of The Cross Company, Detroit, Mich.

A. F. ANJESKEY, sales manager of the Cleveland Tramrail Division, Cleveland Crane & Engineering Co., Wickliffe, Ohio, was elected president of the Monorail Manufacturers' Association, 71 W. 35th St., New York 1, N. Y., at the recent annual meeting in Chicago. WILBUR MAYER, sales manager of the Louden Machinery Co., Fairfield, Iowa, was elected vice-president, and E. DONALD TOLLES, secretary-treasurer.

A. F. Anjeskey, new president of the Monorail Manufacturers' Association

IF YOU DO PRODUCTION MILLING ON CAST IRON...

Are You Willing to Spend $348.00--To Make $3,336.50?



Then Read this Performance Report on the AXIAL FACE KENNAMILL

Long Life and Extremely Low Maintenance Are Cost-Saving Advantages of Solid Blade Axial Face Kennamill

The operation detailed in the table is a production job—where tooling costs are an important factor. It comprises straddle milling the top and bottom surfaces of cast iron cylinder heads.

Use of the Axial Face Kennamill reduced milling costs on this job 80%. And—this saving was made even though the competitive cutter was carbide-tipped, and performed exceptionally well.

The Axial Face Kennamill has extremely abrasion-resistant *solid Kennametal* blades, securely held in position by wedge construction, which prevents thermal strains and permits the high strength of Kennametal to be utilized. These blades can be sharpened at minimum expense in a standard tool and cutter grinder. No steel has to be ground. Only two readily-accessible blade surfaces need sharpening.

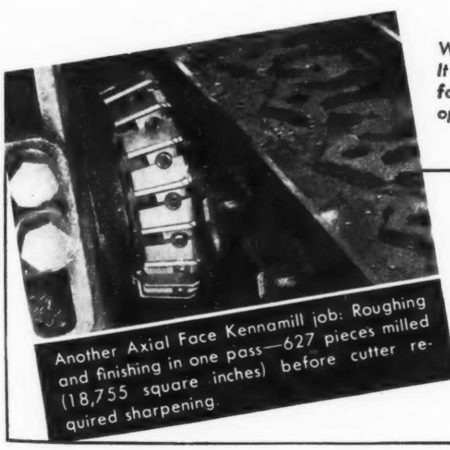
In the typical report shown at the right these facts stand out:
- Solid Kennametal blades last twice as long between regrinds
- More than 10 times as many regrinds can be made per blade
- Only one-half as much time is required to sharpen the cutter

Ask our representative to show you what solid blade Axial Face Kennamills can do on your cast iron milling jobs.

KENNAMETAL®
SUPERIOR CEMENTED CARBIDES
KENNAMETAL *Inc.*, LATROBE, PA.

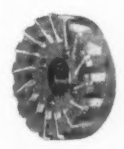
Comparative Results	Competitive Cutter (Carbide Tipped Blades)	Axial Face Kennamill (Solid Kennametal Blades)
No. castings milled per 8 hr. shift	140	140
Number blades per pair of cutters	48	52
Cost per blade	$1.20 (est)	$4.20
Cost, two complete cutters	$312.00	$660.00
Number regrinds per blade	22	250
Number castings milled per grind	140	280
Number hours between grinds	8	16*
Blade cost per 8 hour shift	$2.618	$.437
Blade cost per casting milled	$.01870	$.00312
Time to grind cutter	90 min.	45 min.
Hourly grinding cost (est)	$4.00	$4.00
Grinding cost per 8 hour shift or per 140 castings	$6.00	$1.50*
Grinding cost per casting milled	$.0428	$.0107
Total blade and grinding cost		
Per 8 hour shift	$8.61	$1.937
Per casting milled	$.0615	$.0138
Per year (2 shifts, 5 days, 50 weeks)	$4,305.00	$968.50
*Reground once every other shift		
Annual savings		**$3,336.50**
at an increased first cost of		**$348.00**

Write for Catalog 48. It describes Kennamills for most face-milling operations.

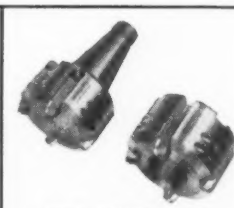


Another Axial Face Kennamill job: Roughing and finishing in one pass—627 pieces milled (18,755 square inches) before cutter required sharpening.

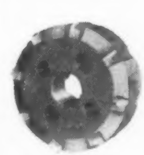
"UNIVERSAL" FACE KENNAMILL (Solid blades)



"CF" KENNAMILL (Solid blades)



STEP KENNAMILLS (Kennametal—tipped blades)



"ODD-JOB" FACE KENNAMILL (Kennametal—tipped blades)

Orrin B. Werntz has been appointed managing director and counsel of the Pressed Metal Institute. Mr. Werntz has been executive secretary of the National Screw Machine Products Association of Cleveland for the last eleven years, and will continue to act in that capacity in addition to filling his new duties. Jerry Singleton has been made assistant manager of the Institute. The offices of the Pressed Metal Institute were moved on March 1 from 829 Union Commerce Bldg., Cleveland, to 13210 Shaker Square, Cleveland 20, Ohio.

Sterling Grinding Wheel Division of the Cleveland Quarries Co., Tiffin, Ohio, has announced the following appointments: Ralph H. Lott, coordinator of sales; Arthur J. Schneider, general sales manager; and William F. Schlick, district manager of the company's Chicago branch, succeeding Mr. Lott, who has been transferred to Tiffin.

J. L. Feuchter has been appointed service engineer in the Ohio territory for the Federal Bearings Co., Inc., Poughkeepsie, N. Y., with headquarters at 402 Swetland Bldg., Cleveland, Ohio. Mr. Feuchter was formerly sales manager of the Bearings Division of Jack & Heintz Precision Industries, Inc.

Acro Electric Co., Cleveland, Ohio, has changed its name to the Acro Switch Co.

Pennsylvania

Hamilton Surface Grinders, Ltd., P. O. Box 77, Sheffield, England, has been formed to manufacture Hamilton grinding and finishing machines in Europe. The new company purchased from the Hamilton Pump Co., Inc., Pittsburgh, Pa., the patents, manufacturing rights, and full selling rights for these machines throughout the British Isles, Europe, India, Pakistan, Australia, and South Africa.

Kennametal, Inc., Latrobe, Pa., manufacturer of cemented-carbide tools, announces the following appointments: C. Russell Miller, service engineer, 2162 Gilbert Ave., Cincinnati, Ohio; Henry B. Worthington, sales engineer, 1537 Main St., Springfield, Mass.; Thomas J. Kniff, Jr., application engineer, 3701 N. Broad St., Philadelphia, Pa.

J. H. Oakes has been made sales manager, enclosed drives, for the Link-Belt Co., Chicago, Ill. Mr. Oakes's headquarters will be at the company's Philadelphia plant. He will be assisted by Harry F. Kurz as representative, with headquarters at the Pershing Road plant, Chicago.

H. H. Mosher has been named manager of carbide sales in the Detroit district for the Firth Sterling Steel & Carbide Corporation, McKeesport, Pa. He was formerly manager of the Buffalo district. Robert L. Springer has been appointed Chicago district manager.

Illinois Tool Works, Chicago, Ill. has appointed Tools, Incorporated, 4427 Germantown Ave., Philadelphia 44, Pa., exclusive Philadelphia representative for the company's line of specially engineered hobs, broaches, and shaper and milling cutters.

Ralph W. Massey has been named Pittsburgh district sales manager of the Superior Steel Corporation, Carnegie, Pa., succeeding Fred. L. Fox, who has been made assistant general sales manager.

Wisconsin and Minnesota

Reltool Corporation, Milwaukee, Wis., manufacturer of metal-cutting tools, has purchased a new plant at 4540 W. Burnham St., which will provide 20,000 square feet of additional floor space for manufacturing operations. The company is moving its main office from 712 W. Michigan St. to the new location.

Wisconsin Carbide Tool Co., Fond du Lac, Wis., announces the removal of its fabricating activities to a new plant at 3343 N. 35th St., Milwaukee 10, Wis. The additional manufacturing area and numerous new machines will permit the company to enlarge its scope of operation in the production of carbide-tipped tools.

C. E. Gobeil Co., 2635 University Ave., St. Paul, Minn., has been appointed representative for the line of air and hydraulic cylinders and special machinery made by the Hydro-Line Mfg. Co., Rockford, Ill.

* * *

Industrial Engineering Film Loan Library

The University of Iowa has recently expanded its Industrial Engineering Film Loan Library, which now includes sixty-five 16-millimeter sound and silent films. These films, which cover motion and time study and work methods, are available to industrial concerns and educational institutions. They are finding wide use at the present time in work methods training programs.

Complete details of this service are published in Extension Bulletin 631, which is obtainable from the Bureau of Audio-Visual Instruction, Extension Division, State University of Iowa, Iowa City, Iowa.

Coming Events

April 7-8—Tenth meeting of the Ohio Welding Conference at Ohio State University, Columbus, Ohio. Further details can be obtained from the Department of Welding Engineering of the university.

April 8-22—German Industrial Exhibit to be held at the Museum of Science and Industry, 30 Rockefeller Plaza, New York City. Exhibit sponsored and arranged by the Joint Export and Import Agency in Frankfort, Germany.

April 11-12—American Institute of Electrical Engineers' Conference on the Industrial Application of Electron Tubes in the Statler Hotel, Buffalo, N. Y. Headquarters of the Society, 33 W. 39th St., New York 18, N. Y.

April 11-13—Fourth annual convention and Lubrication Show of the American Society of Lubrication Engineers at the Hotel Statler (formerly Pennsylvania), New York City. Secretary, W. F. Leonard, 343 S. Dearborn St., Chicago 4, Ill.

April 11-13—Aeronautic and Air Transport Meeting of the Society of Automotive Engineers at the Hotel New Yorker in New York City. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

April 11-16—Sixth Western Metal Congress and Exposition at the Shrine Auditorium, Los Angeles, Calif. For further information, address National Secretary of American Society for Metals, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

April 19-20—Annual meeting and Product Exhibit of the Magnesium Association at the Edgewater Beach Hotel, Chicago, Ill. Publicity chairman, A. J. Peterson, care of Apex Smelting Co., 2537 W. Taylor St., Chicago 12, Ill.

April 21-22—Fourth annual Time Study and Methods Conference of the Society for the Advancement of Management at the Hotel Statler, New York City. For further information, address Lawrence Heyl, Jr., at the Society's headquarters, 84 William St., New York 7, N. Y.

April 25-28—Fourth Southern Machinery and Metals Exposition in the Atlanta Municipal Auditorium, Atlanta, Ga. Michael F. Wiedl, managing director, 267 E. Paces Ferry Road, N.E. Atlanta, Ga.

April 26-27—Machine Tool Electrification Forum sponsored by the

Westinghouse Electric Corporation, Pittsburgh 30, Pa., in Buffalo, N. Y.

MAY 10-13—Eighteenth annual NATIONAL PACKAGING EXPOSITION in the Public Auditorium, Atlantic City, N. J. Sponsored by the American Management Association, 330 W. 42nd St., New York 18, N. Y.

MAY 19-21—Spring meeting of the SOCIETY FOR EXPERIMENTAL STRESS ANALYSIS at the Hotel Statler, Detroit, Mich. For further information, address the Society, P.O. Box 168, Cambridge 39, Mass.

JUNE 27-30—Thirty-Sixth Annual Convention of the AMERICAN ELECTROPLATERS SOCIETY in Milwaukee, Wis., with headquarters at the Schroeder Hotel. For further information, address the Society at 473 York Road, Jenkintown, Pa.

JUNE 27-JULY 1—Annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Hotel Chalfonte-Haddon Hall, Atlantic City, N. J. Headquarters of the Society, 1916 Race St., Philadelphia 3, Pa.

SEPTEMBER 26-28—NATIONAL ELECTRONICS CONFERENCE at the Edgewater Beach Hotel in Chicago, Ill. Sponsored by the Illinois Institute of Technology, Chicago 16, Ill.

OCTOBER 10-14—National meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS in San Francisco, Calif.; headquarters, Fairmont Hotel. Headquarters of the Society, 1916 Race St., Philadelphia 3, Pa.

OCTOBER 17-21—METAL CONGRESS and EXPOSITION to be held in connection with the thirty-first annual meeting of the AMERICAN SOCIETY FOR METALS at the Public Auditorium in Cleveland, Ohio. National secretary, W. H. Eisenman, 7301 Euclid Ave., Cleveland 3, Ohio.

New Books and Publications

THOMAS' REGISTER OF AMERICAN MANUFACTURERS (1949). 7900 pages, 9 by 14 inches. Published by the Thomas Publishing Co., 461 Eighth Ave., New York 1, N. Y. Price, $15 (renewal, $12.50).

The thirty-ninth edition of this valuable buying guide or "purchasing encyclopedia" covers all the manufactured products in the United States, the completeness of its scope and informative content necessitating nearly 8000 pages. There are more than 70,000 product classifications listed. To make reference to this huge work convenient, it is published in three volumes.

Volumes I and II list the names and addresses of manufacturers classified by products. The products are classified not only by generalized group names, but by specific types, so that the prospective buyer can easily find a particular kind of product that will meet his requirements. The material is thoroughly cross-indexed. The names of the manufacturers under each product classification are arranged by states and cities, thus making it easy for the buyer to select a product within a certain geographical boundary if shipping considerations must influence the selection. An added feature of value to the buyer is the size or capital rating given for each manufacturer. Volume III (1000 pages) contains an alphabetical list of manufacturers, with branches, subsidiaries, and other data such as company officials and cable codes; it also gives an alphabetical list of trade names, together with export and other miscellaneous information. In addition to the three cloth-bound volumes containing the directory data, there is an index, or finding list, published in a separate paper-bound book, which facilitates locating the required information.

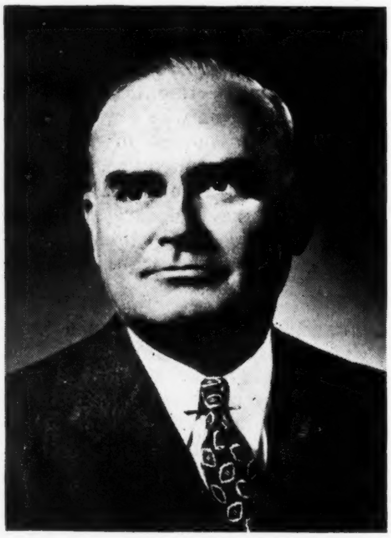
Purchasing departments and buyers, as well as all those who require a list of products or names of manufacturers for various purposes, will find this work an invaluable aid. It is compiled and revised carefully, thus making the book a dependable reference guide to American manufacturers in any line.

MANUAL OF DIE-HEAD THREAD CUTTING. By H. Schlarman. 266 pages, 5 1/2 by 8 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, $3.50.

This manual has been written to provide a practical guide on threads and threading for small tool supervisors, tool-room and screw-machine foremen or operators, maintenance men, and draftsmen. It explains the basic principles of producing threads with die-heads, the application of those principles, and the causes of common troubles experienced in threading, together with the required corrective measures. An idea of the scope of the book will be obtained from the following list of chapter headings: Producing Threads—Equipment and Methods; Unusual Die-Head Adaptations; Types of Die-Heads and Chasers; Die-Head Troubles and Maintenance; Chaser Facts for the Thread Man; Principles and Methods of Sharpening the Radial Chaser, the Tangent Chaser, and the Circular Chaser; General Information on Chaser Usage; Gaging External Threads; Thread Troubles; Thread Samples and Analysis; and The Draftsman and the Thread.

General Thomas S. Hammond (right), chairman of the board of the Whiting Corporation, Harvey, Ill., being presented with a gold wrist-watch by his son Stevens H. Hammond, upon his completion of twenty-five years' service with the company. Watches were also presented to 116 other employes who had become members of the Whiting Quarter Century Club. The presentation was made at the annual meeting of the corporation. Preceding the meeting, the club members were guests of the company at a dinner in the Del Prado Hotel, Chicago.

Obituaries



James A. Wright

James A. Wright, vice-president and general manager of the Morse Twist Drill & Machine Co., New Bedford, Mass., died suddenly, while aboard a train, on March 3. Mr. Wright was born in Denver, Colo., in 1893. He had been with Morse Twist Drill & Machine Co. since its purchase in 1946 by the Van Norman Co., Springfield, Mass. Previously, he had been assistant sales manager of the Van Norman Machine Tool Division. During World War II, Mr. Wright served for several months in the Machine Tool Division of the War Production Board. Before the war, he had been, for twenty years, director of sales for the Indian Motorcycle Co., Springfield, Mass., and prior to that was affiliated with the Auburn Spark Plug Co., of Auburn, N. Y.

Charles H. Wilson

Charles H. Wilson, chairman of the board of the Wilson Mechanical Instrument Division of the American Chain & Cable Co., Bridgeport, Conn., died on March 9. Mr. Wilson was an outstanding figure in the hardness testing field. He developed the well-known Rockwell hardness tester, and during the late war contributed a great deal to the development of micro-hardness testing, introducing the Tukon tester, which was designed especially for this field.

Mr. Wilson was graduated from the Columbia University School of Mines in 1902, and four years later began his business career by forming the Wilson Maeulen Co. to manufacture pyrometers. This business was sold in 1932 to the Foxboro Co. In 1915, he began the manufacture of a machine marketed under the name "Tapalog," which was the first multiple recorder of industrial heats to be put on the market. Mr. Wilson began the development of the Rockwell hardness tester in 1920 under the name of the Wilson Mechanical Instrument Co.

Alvin B. Einig

Alvin B. Einig, general manager and director of the Motch & Merryweather Machinery Co., Cleveland, Ohio, died on February 27 of a heart ailment, at the age of sixty-five years. Mr. Einig was widely known in the machine tool field. Following his graduation from the Case School of Applied Science in 1909, he joined the Motch & Merryweather Machinery Co. in a sales capacity, and for the ensuing forty years was active in the distribution of metal-working machinery in the Middle West.

During World War I, Mr. Einig went to Washington as assistant to the late George Merryweather, who was head of the machine tool procurement activities of the War Industries Board. In World War II, Mr. Einig was called to Washington by General Knudsen and made Administrative Officer of the Tools Division in the Office of Production Management, later the War Production Board. After the war, he was appointed machine tool expert on the U. S. Reparations Mission which made a world flight in 1947 to study conditions in various countries for the State Department.

Mr. Einig was a member of the American Society of Mechanical Engineers, the Cleveland Engineering Society, and other associations. He served as president of the American Machine Tool Distributors' Association in 1945 and 1946.

Alvin B. Einig

Ertie L. Foreman, manager of the Los Angeles office of Whitman & Barnes, Detroit, Mich., died suddenly on February 9 of a heart attack, at the age of fifty-five years. Mr. Foreman was born in Florida, and went to Detroit in 1910, where he became associated with the Detroit Twist Drill Co., which company was later merged with Whitman & Barnes. In 1930, he was made plant superintendent at Detroit, and two years later engaged in sales work for the company. After serving as manager of the New York office for some time, he was transferred in 1941 to the Pacific Coast. When the company opened its branch office and warehouse in Los Angeles in 1944, Mr. Foreman was appointed manager.

Winfred W. Elliott, founder of the Elliott Mfg. Co., Binghamton, N. Y., maker of flexible shafting and equipment, died on January 26. Active in the flexible-shaft industry since 1898, Mr. Elliott had been a partner in the Binghamton Flexible Shaft Co. from 1920 to 1931, when he sold out to establish the Elliott Mfg. Co. in 1932. As the result of a long illness he had been inactive in the organization during the past year. Last July he sold his interest to the remaining partners—his son, Boyd W. Elliott, and his son-in-law, Wilbur J. Kupfrian, who will continue the business.

William C. Madsen, branch manager of the Gary, Ind., office of the Reliance Electric & Engineering Co., Cleveland, Ohio, died on March 8 at the Marine Hospital in Cleveland. Mr. Madsen was born in Alliance, Ohio, on February 10, 1919, obtaining his early schooling in that city. He had been connected with the company since his graduation from Case Institute of Technology in 1941. His professional affiliations included membership in the American Institute of Electrical Engineers and the Association of Iron and Steel Engineers.

Willis J. Snyder, formerly head design engineer with the Defiance Machine Works, Inc., Defiance, Ohio, died on February 19. Mr. Snyder was active in the special machine design field for over twenty years. He resigned his position with the Defiance Machine Works in 1944 because of poor health. He is survived by his widow, two daughters and four sons.

Gilbert L. Church, assistant treasurer of the Brown & Sharpe Mfg. Co., Providence, R. I., died suddenly on February 27 at his home in Lincoln, R. I., aged sixty-nine years. Mr. Church had been associated with the company since 1906, starting as assistant cashier and becoming assistant treasurer in 1918. He had also served as assistant treasurer of the company's subsidiaries, Brown & Sharpe of New York and Brown & Sharpe Co.